Harrell Stream and Wetland Restoration Site
Monitoring Report – MY03
Edgecombe County, NC

Submitted to:

Ecosystem Enhancement PROGRAM

NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

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EXECUTIVE SUMMARY

The Harrell Stream and Wetland Restoration Site is a full-delivery project that was developed for the North Carolina Ecosystem Enhancement Program (EEP). Construction was completed in September 2007 on an Unnamed Tributary to Swift Creek and 15.0 acres of Coastal Plain Small Stream Swamp wetland community. The 441-acre watershed at the downstream limits of the project stream and the 57-acre watershed draining into the project wetland are located within the USGS 14-digit HUC 03020101130090 and the NCDWQ Sub-basin 03-03-02 in the Tar-Pamlico River Basin. The project restored 6,808 linear feet of channel using a combination of Priority 2 and 3 approaches, and 15.0 acres of Coastal Plain Small Stream Swamp wetland community, generating 6,808 stream mitigation units and 15.0 wetland mitigation units. The stream design addressed vertical instability problems and a lack of bed variability by stabilizing stream banks, installing in-stream structures, adjusting stream planform, and replanting the riparian areas with native vegetation. The wetland was restored by filling ditches, creating microtopography, and planting native trees and shrubs. This report describes the results from the findings of the third year of monitoring that took place in 2010.

The riparian buffer was planted with twelve different species of bare root trees and shrubs and three different species of live stakes. The restored wetland was planted with eleven different species of bare root trees and shrubs. Vegetation monitoring plots were established during the as-built survey and included 18 monitoring plots placed throughout the stream buffer and 12 monitoring plots installed in the restored wetland. Vegetation must meet a minimum survival success rate of 320 stems/acre after five years. Between the second and third monitoring years supplemental planting was conducted on isolated sections of the stream restoration. The third-year monitoring counted an average of 598 stems/acre in the stream plots and 533 stems/acre in the wetland plots. The third-year monitoring found the vegetation component of the project to be on track to meeting the success criteria.

The stream assessment completed during third-year monitoring found the stream to be stable and functioning properly. Channel dimensions have not changed significantly from the first-year monitoring. The small portions of localized bed erosion, aggradation, and degradation that were noted during previous monitoring years have not become problematic or caused any instability in the stream. Any problem areas noted during the third-year monitoring have been documented in the Current Condition Plan View. The on-site stream gauges have recorded multiple bankfull events since the project was constructed in September 2007.

During the 2010 monitoring year, wetland hydrology was achieved at all four wells in the restoration area. In 2010 groundwater was within 12 inches of the soil surface for at least 18 consecutive days (8% of the growing season) at each well, which exceeds the 5% success criteria.

The daily rainfall data depicted on the gauge data graphs were obtained from the on-site precipitation gauge. The precipitation gauge was installed on the site prior to project implementation. The daily rainfall data obtained from a local weather station shows that the area had average rainfall during the 2010 growing season and correlated to the precipitation data recorded on-site.

1.0 PROJECT BACKGROUND

Project Goals and Objectives

The goals and objectives of the restoration project are as follows:

Restoration Goals:

- Protect aquatic resources from excess nutrients, sediment, and other pollutants coming from the agricultural watershed.
- Reestablish terrestrial and aquatic habitat and connect the site to the existing floodplain corridor along Swift Creek.

Restoration Objectives:

- Restore 6,808 linear feet of stable stream channel with the appropriate pattern, profile, and dimension that can support a sand transport system.
- Connect the stream to a functioning floodplain.
- Fill and plug ditches in the drained hydric soils to restore saturated hydrologic conditions for 5% of the growing season.
- Plant tree species typical of a Coastal Plain Small Swamp Stream along the stream riparian corridor and floodplain as well as in the restored wetland.

1.1 Project Structure, Restoration Type, and Approach

Prior to restoration, UT to Swift Creek had been channelized and straightened since at least 1948. The entire site, including where the wetland was restored, was under agricultural production. There were fields adjacent to the stream and the wetland that had been drained by a network of ditches. There were no remaining vegetated buffers or in-stream features in the channel and the banks were nearly vertical. The channel was characterized as having poor streambed variability and habitat diversity. Restoration of 6,808 linear feet of channel was accomplished utilizing a combination of Priority Levels 2 and 3 (Table 1). Reach 1 (Station 10+00 to 22+26) was restored using a Priority Level 3 approach. The restoration of a B5c channel with a sinuosity of 1.06 was accomplished by building a bankfull channel with a higher width/depth ratio than the existing stream, creating distinct bed features by adding pools and riffles to the profile, and grading back the upper slopes to create an appropriate valley for the stream. Reaches 2, 3, and 4 (Stations 22+26 to 36+91, 36+91 to 51+82, and 51+82 to 78+80, respectively) were restored to a C5 channel with a Priority Level 2 restoration. The restoration established a bankfull channel with a new floodplain where the designed bankfull stage equals the new floodplain elevation (bank height ratio=1.0). Reaches 2, 3, and 4 have sinuosity values of 1.07, 1.23, and 1.10, respectively. The four different reaches are shown in Figure 2.

1.2 Location and Setting

The Harrell Stream and Wetland Restoration Site is located approximately six miles northeast of Rocky Mount, North Carolina in Edgecombe County (Figure 1). The latitude and longitude of the project site are 36.0201 North and 77.6807 West (WGS1984). To reach the site from Raleigh, proceed east on U.S. Route 264-East/64-East (US 264E/64E) for approximately 17 miles. Continue on US 64E for another 30 miles. Take the U.S. Route 301 Bypass and then U.S. Route 301 (US 301) north into Battleboro. Make a right onto Battleboro-Leggett Road and then turn left onto Morning Star Church Road just outside of town. Proceed through Cherry Crossroads and continue for 2.25 miles. The project site is on the left side of Morning Star Church Road and is directly opposite the junction with Benson Farm Road.

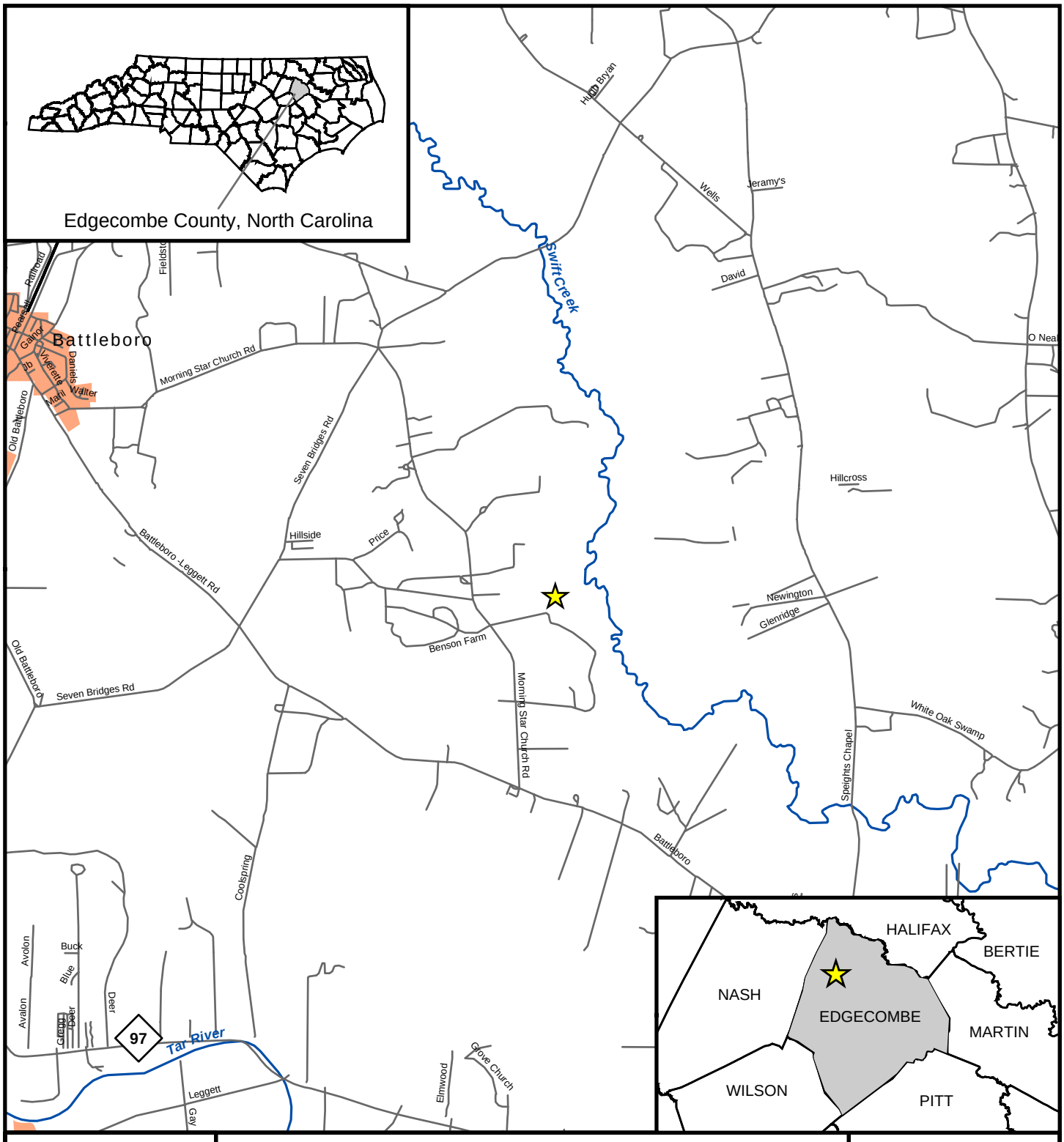

Figure 1. Vicinity Map

- Project Site Location
- Major Streams and Rivers
- Municipalities
- Roads

N
W E
S

1:63,360

1 inch equals 1 miles

1 0.5 0 1 Miles

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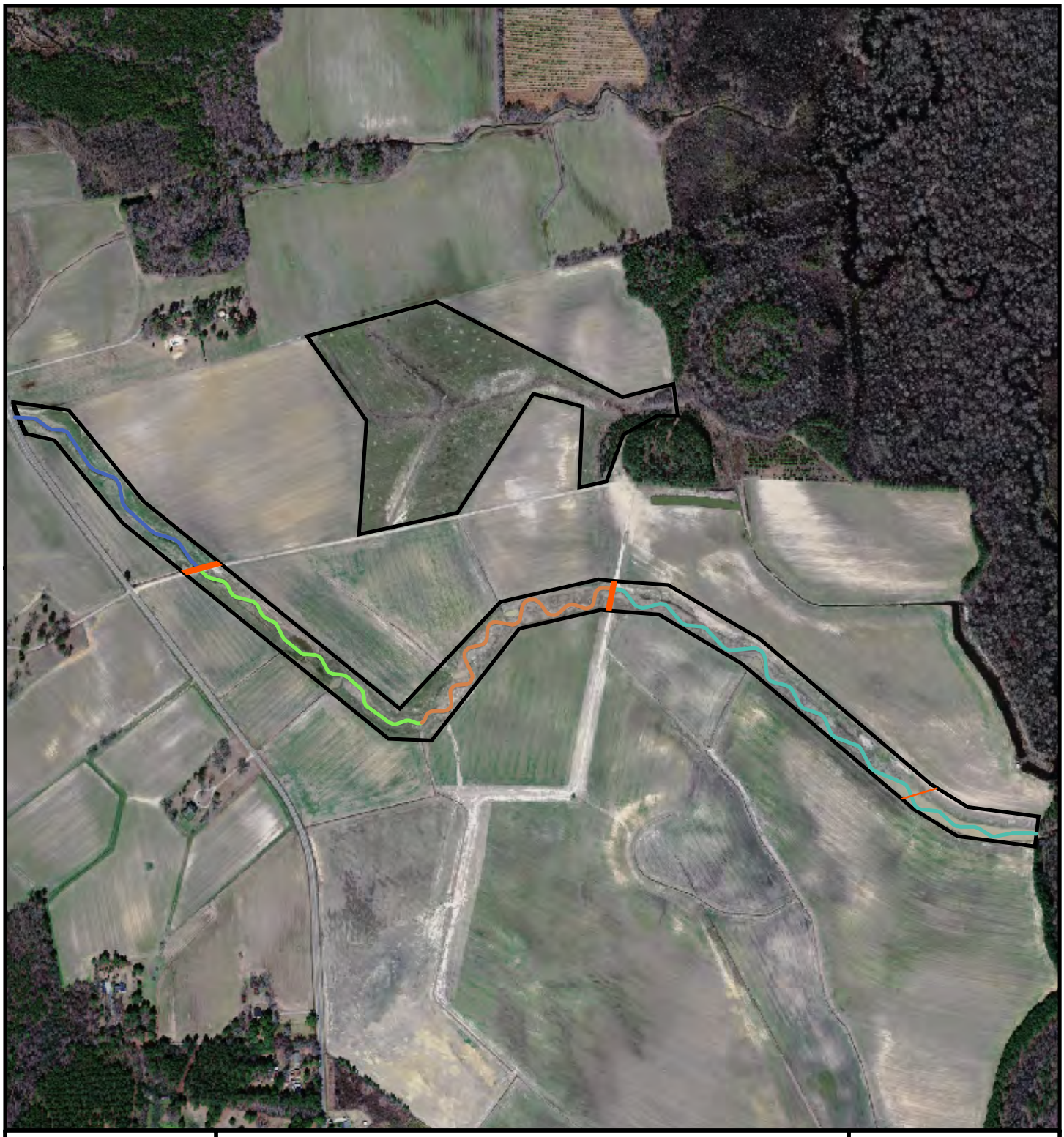

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Figure 2. Project Reaches

Reach 1
Reach 2
Reach 3
Reach 4

Easement Exception
Project Site Boundary

N
W
E
S

1:8,400

700 350 0 700 Feet

Image Source: Edgecombe County Orthoimagery, 2008.

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1.3 Project History and Background

Table I. Project Restoration Components
Harrell Stream and Wetland Restoration

Project Segment / Reach ID	Pre-Restoration Feet/Acres	Type	Approach	As - Built Footage or Acreage	Stationing	Stream or Wetland Mitigation Units (SMU/WMU)*
Reach 1	1,224 lf	R	P3	1,226 lf	10+00 - 22+26	1,226 SMU
Reach 2	1,389 lf	R	P2	1,465 lf	22+59 - 36+91	1,432 SMU
Reach 3	1,231 lf	R	P2	1,491 lf	36+91 - 51+82	1,491 SMU
Reach 4	2,494 lf	R	P2	2,698 lf	52+12 - 78+80	2,659 SMU
Wetland	15.0 ac	R	-	15.0 ac	-	15 WMU

R = Restoration P2 = Priority 2
P3 = Priority 3

* Two 30' farm crossings and one 10' irrigation crossing are excluded from the mitigation unit calculations.

Table II. Project Activity and Reporting History
Harrell Stream and Wetland Restoration

Activity or Report	Data Collection Complete	Completion or Delivery
Final Design - Wetland	2005 - 2006	Aug 06
Construction - Wetland	N/A	Oct 06
Planting - Wetland	N/A	Feb 07
Restoration Plan	2005 - 2006	Apr 07
Final Design - Stream	2005 - 2006	Apr 07
Construction - Stream	N/A	Sep 07
Planting - Stream	N/A	Jan 08
Mitigation Plan / As-Built (Year 0 Monitoring - Baseline)	Oct 07 / Jan 08*	Feb 08
Year 1 Monitoring	Oct 08	Nov 08
Year 2 Monitoring	Nov 09	Dec 09
Year 3 Monitoring	Nov 10	Dec 10

*The wetland restoration was constructed one year prior to the stream restoration and as-built

Table III. Project Contact Table Harrell Stream and Wetland Restoration	
Design Firm	KCI Technologies, Inc. Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Gary Mryncza Phone: (919) 783-9214 Fax: (919) 783-9266
Construction Contractor	Environmental Technologies and Construction Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Ryan McDavitt Phone: (919) 783-9214 Fax: (919) 783-9266
Planting Contractor	H & J Forest Services PO Box 458 Holly Ridge, NC 28445 Phone: (910) 512-6754
Monitoring Performers	
MY-00 - MY-05	KCI Technologies, Inc. Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table IV. Project Background Table **Harrell Stream and Wetland Restoration**		
Project County		Edgecombe County
Physiographic Region		Coastal Plain
Ecoregion		Southeastern Floodplains and Low Terraces
Project River Basin		Tar-Pamlico
USGS HUC for Project and Reference		03020101130090 (UT to Swift Creek)
		03040101080010 (Mitchell River)
		03030002060140 (North Prong Creek)
NCDWQ Sub-basin for Project and Reference		03-03-02 (UT to Swift Creek)
		03-07-02 (Mitchell River)
		03-06-05 (North Prong Creek)
Drainage Area	Wetland	0.09 sq. mi.
	Stream	0.60 sq. mi.
Stream Order		Second Order
Watershed Type (Rural, Urban, Developing, etc.)		Rural
Watershed LULC Distribution	Urban	<1%
	Ag-Row Crop	95%
	Ag-Livestock	1%
	Forested	4%
	Water/Wetlands	<1%
Watershed impervious cover (%)		<1%
Rosgen Classification of As-built (Stream)		B5c / C5
Cowardin Classification (Wetland)		Palustrine - forested wetland
NCDWQ Classification for Project		NSW, Class C
Within EEP Watershed Plan?		No
Any portion of the project segment upstream of a 303d listed segment?		No
Reasons for 303d Listing or Stressor		N/A
Total project acreage of easement		44.5 Acres
Total planted acreage		43.0 Acres
WRC Class (Warm, Cool, Cold)		warm
Species of concern, endangered etc.		none
Pre-construction Beaver activity?		Historically, according to landowner
Dominant Soil Types	Wetland	Roanoke loam series
	Stream	Roanoke loam and Wagram loamy sand series
% of Project Easement Fenced		0%

PP# W2

CONSERVATION EASEMENT

VEG PLOT W7

VEG PLOT W6

VEG PLOT W9

WETLAND GAUGE 2

WETLAND GAUGE 3

VEG PLOT W5

WETLAND RESTORATION BOUNDARY (15 ACRES)

VEG PLOT W8

VEG PLOT W10

VEG PLOT W11

PP# W3

VEG PLOT W3

VEG PLOT W2

WETLAND GAUGE 1

VEG PLOT W4

VEG PLOT W12

PP# W5

CONSERVATION EASEMENT

WETLAND GAUGE 4

VEG PLOT W1

PP# W1

PP# W4

NC GRID NAD 83

-60 -30 0 60 120

GRAPHIC SCALE

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

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4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

HARRELL SITE
STREAM AND WETLAND RESTORATION

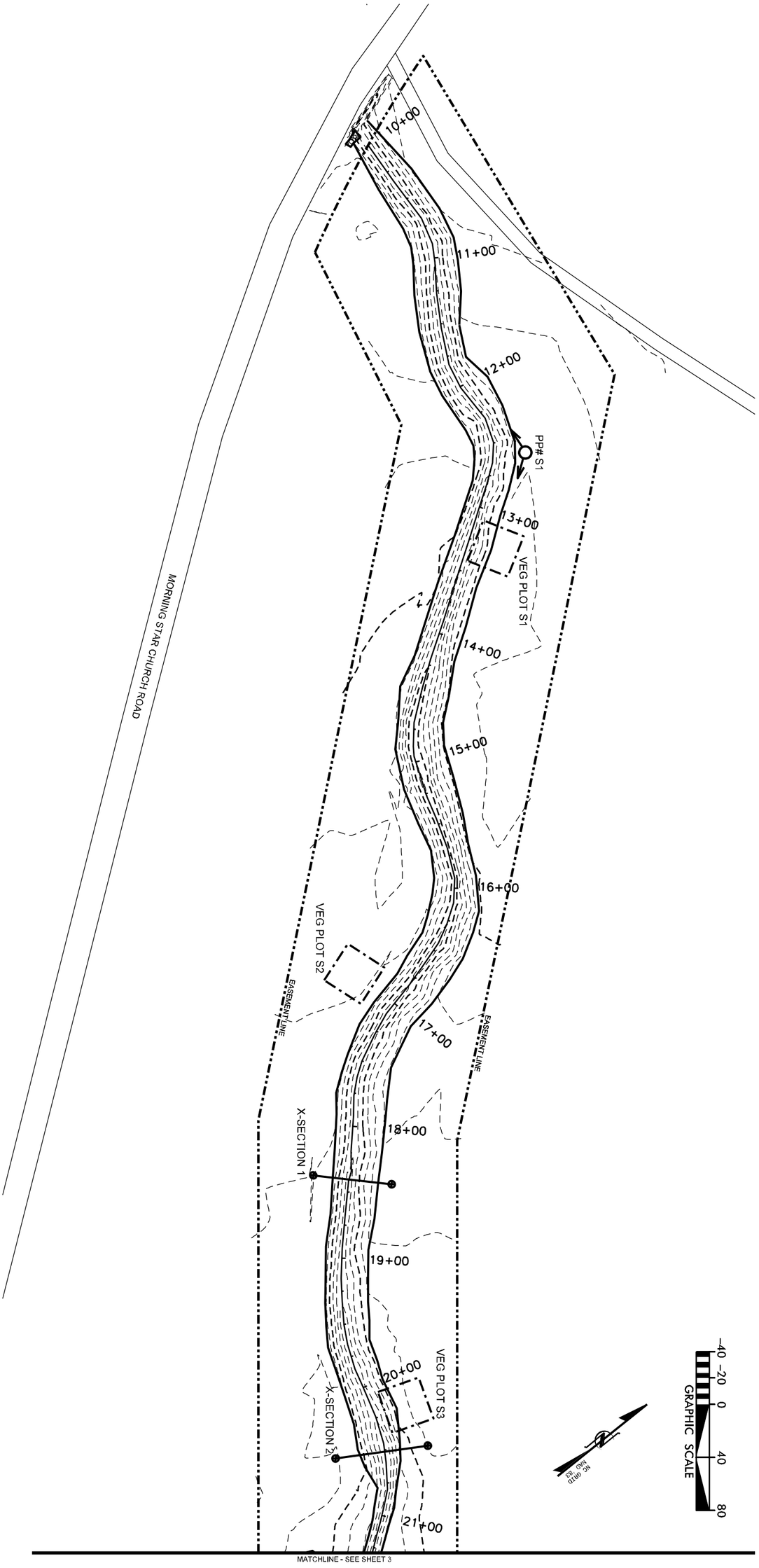
EDGECOMBE CO., NORTH CAROLINA

DATE: DEC 2010

SCALE: 1"=120'

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 7



CURRENT CONDITION PLAN VIEW

SHEET 2 OF 4

DATE: DEC 2010

SCALE: 1"=80'

HARRELL SITE
STREAM AND WETLAND RESTORATION

EDGECOMBE CO., NORTH CAROLINA

STATION 10+00 TO STATION 21+29

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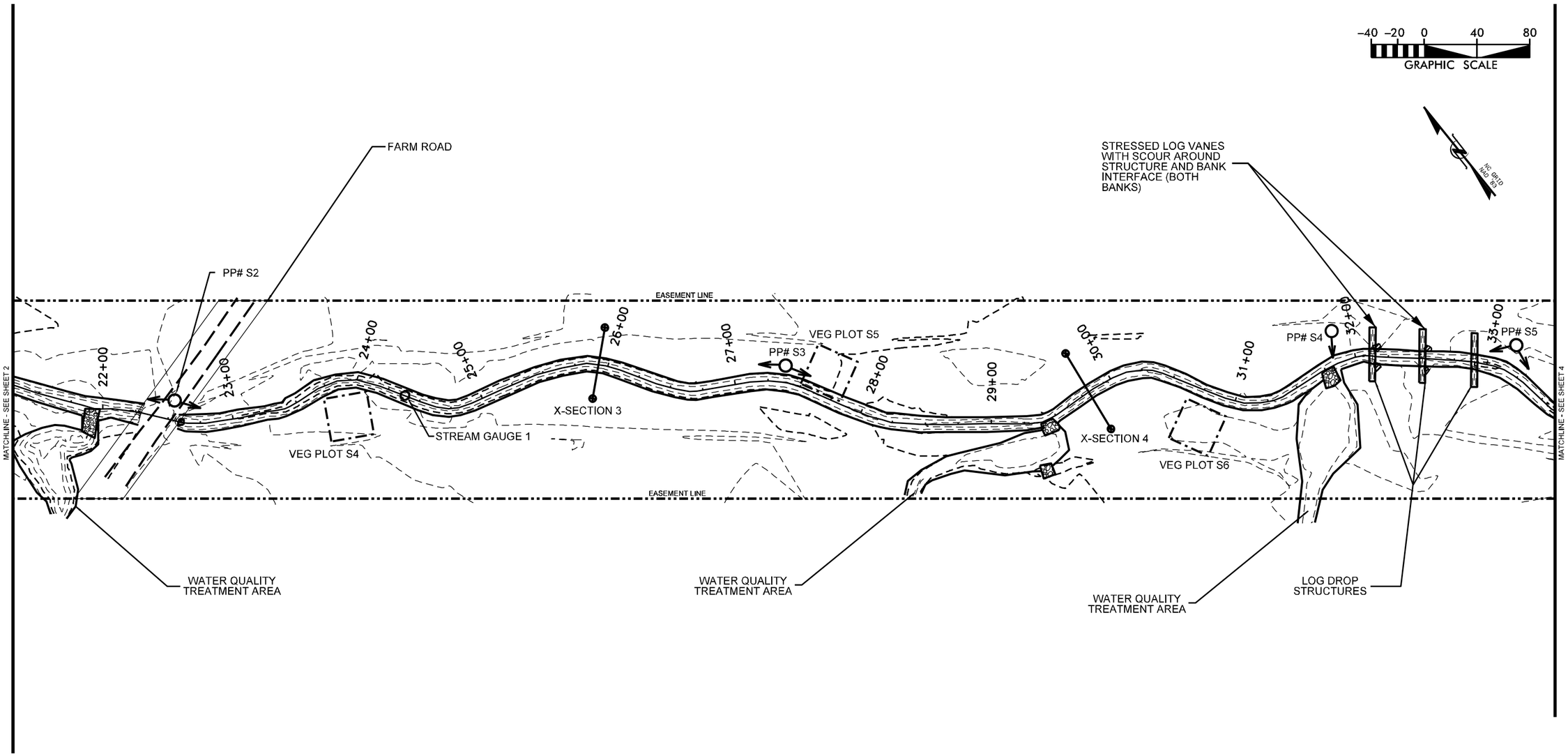
SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		



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HARRELL SITE
STREAM AND WETLAND RESTORATION

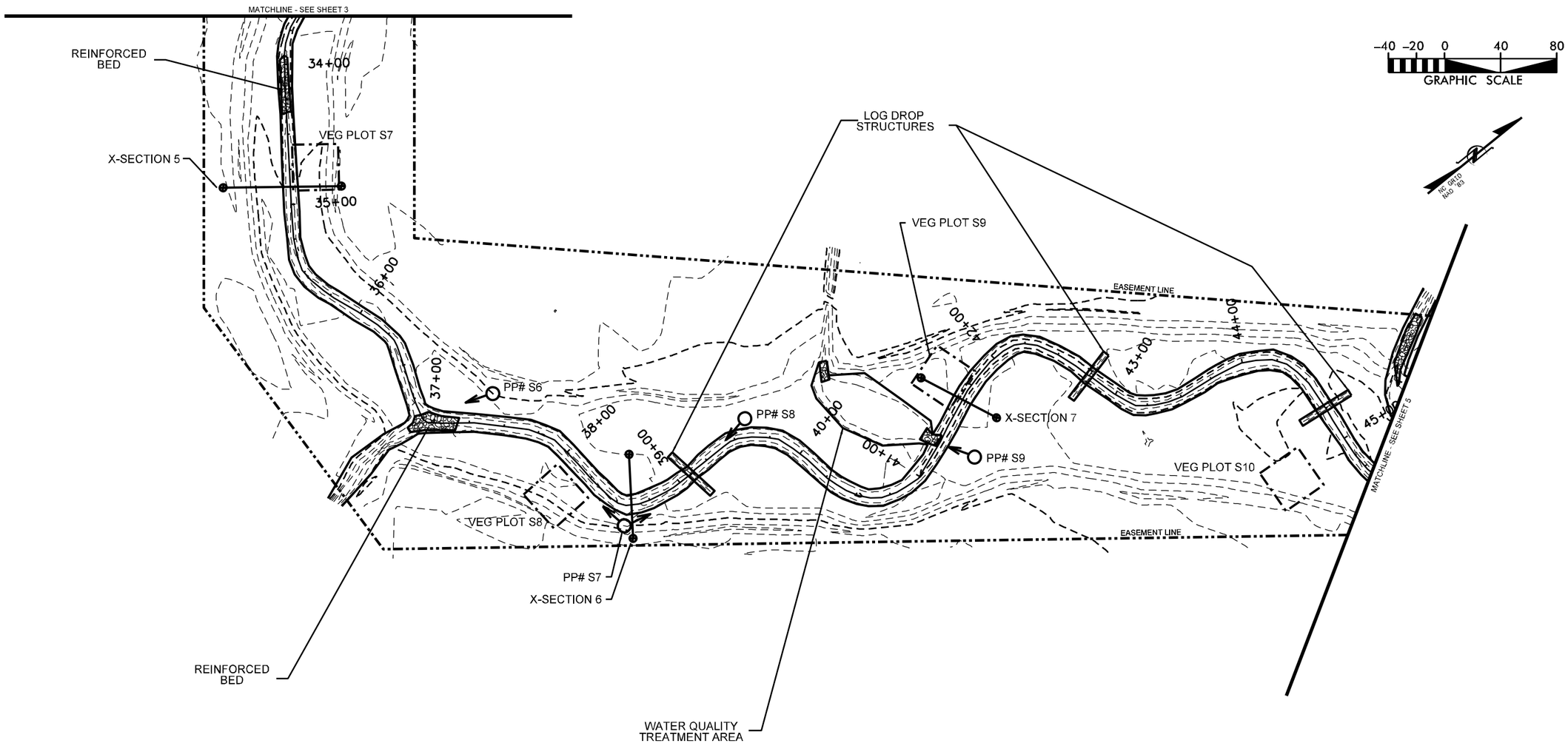
EDGECOMBE CO., NORTH CAROLINA

STATION 21+29 TO STATION 33+64

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



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	REVISIONS		

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HARRELL SITE
STREAM AND WETLAND RESTORATION

EDGECOMBE CO., NORTH CAROLINA

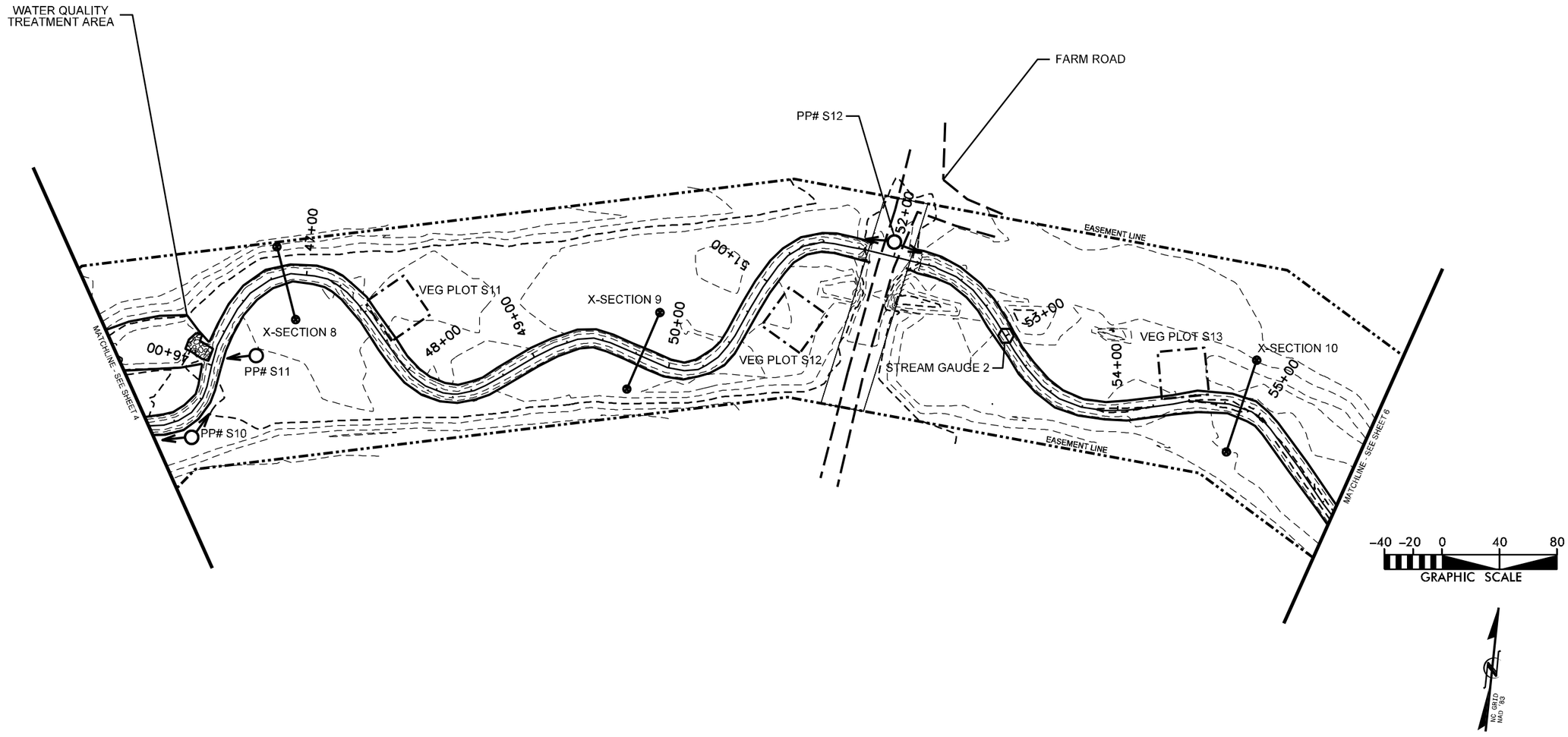
STATION 33+64 TO STATION 45+31

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 4 OF 7



NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

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HARRELL SITE
STREAM AND WETLAND RESTORATION

EDGECOMBE CO., NORTH CAROLINA

STATION 45+31 TO STATION 55+86

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

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HARRELL SITE
STREAM AND WETLAND RESTORATION
EDGECOMBE CO., NORTH CAROLINA

STATION 55+86 TO STATION 66+94

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 6 OF 7

UNDERGROUND IRRIGATION PIPE

PP# S16

PP# S15

VEG PLOT S16

VEG PLOT S18

VEG PLOT S17

X-SECTION 12

X-SECTION 13

X-SECTION 14

EASEMENT LINE

EASEMENT LINE

68+00

69+00

70+00

71+00

72+00

73+00

74+00

75+00

76+00

77+00

78+00

MATCHLINE - SEE SHEET 6

-40 -20 0 40 80

GRAPHIC SCALE

NC GRID NAD 83

NO.	DESCRIPTION	DATE	APPROVED
STAL	REVISIONS		

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RALEIGH, NORTH CAROLINA 27609

HARRELL SITE

STREAM AND WETLAND RESTORATION

EDGECOMBE CO., NORTH CAROLINA

STATION 66+94 TO STATION 78+80

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 7 OF 7

2.0 PROJECT CONDITIONS AND MONITORING RESULTS

2.1 Vegetation Assessment

The planted vegetation on the site is growing well. There are a few spots of sparse vegetation throughout the stream site due to poor soil being exposed in the floodplain during the Priority 2 restoration. Also, due to backwater from Swift Creek, the downstream portion of the stream buffer can become flooded, drowning out trees planted in this area. Some supplemental planting was conducted in the winter of 2009/2010 with trees more tolerant of saturated conditions and additional supplemental planting will take place during the upcoming 2010/2011 winter.

The low stream flow throughout the summer allows vegetation to become established in the stream channel. This vegetation includes grasses, rushes, cattails, and Asian dayflower (*Murdannia keisak*). During the past three years of monitoring, the vegetation in the channel has not caused any problems such as redirecting flows into streambanks and causing erosion. Overall the channel vegetation has increased the stability of the system and is typical of small stream swamp vegetative communities, which is the target vegetative community for the site.

The wetland continues to show high survivability and vigorous growth of the planted trees.

Some scattered populations of invasive species have been identified in the floodplain area, which include: Chinese lespedeza (*Lespedeza cuneata*) and tropical soda apple (*Solanum viarium*). Asian dayflower was present within the channel in isolated areas. Japanese honeysuckle (*Lonicera japonica*) was observed on the outer edges of the project. Although they are not a problem at this time, these populations will continue to be monitored to determine if invasive control is required in the future.

The monitored vegetation plots within the stream buffer and wetland revealed that the planted vegetation is growing well with 598 and 533 stems/acre, respectively. Only a few monitoring plots have low stem counts. The overall vegetation assessment found the site to be on track to meeting the vegetative success criteria.

The vegetative monitoring results are displayed in Appendix A and in the Current Condition Plan View.

2.2 Stream Assessment

During the 2010 growing season, the stream experienced low flows, which is typical of the summer months. The on-site stream gauge recorded three bankfull events on January 25, March 29, and September 30, 2010.

The stream assessment found the stream to be generally stable, with no significant changes from the previous monitoring year. Periodic storm events caused isolated bed degradation in reaches 1 and 2. Some of these areas are visible on the longitudinal profile and cross-section plots. These patterns are typical for a stream like UT to Swift Creek. Its sand bed system is much more mobile than a gravel stream. Because of this, it is expected that patterns of aggradation and degradation are more dynamic within these systems. These dune/anti-dune streams will experience bed variation over time. The stream banks and floodplain experienced little to no erosion throughout the project. Piping is occurring at one in-stream structure, but the rest of the structures are performing as designed. The water quality treatment areas are stable and retaining water. All of these stream features will continue to be monitored to make sure that any observed changes are within the range of variability found in stable stream systems.

The stream assessment monitoring is described in Appendix B and the Current Conditions Plan View.

2.2.1 Bankfull Events

Table V. Hydrological (Bankfull) Verifications
Harrell Stream and Wetland Restoration Site

Date of Data Collection	Date of Occurrence	Method	Photo Number
10/10/2007	10/10/2007	Stream Gauge	N/A
10/27/2007	10/27/2007	Stream Gauge	N/A
7/6/2008	7/6/2008	Stream Gauge	N/A
6/9/2009	6/9/2009	Stream Gauge	N/A
1/25/2010	1/25/2010	Stream Gauge	N/A
3/29/2010	3/29/2010	Stream Gauge	N/A
9/30/2010	9/30/2010	Stream Gauge	N/A

2.2.2 Quantitative Measures Summary Tables

Table VI a. Reach 1 Baseline Stream Summary
Harrell Stream and Wetland Restoration

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)		5.4			1	29.2			35.0		10.0			10.2		1
Floodprone Width (ft)		>70			1	44			64		>18			22		1
Bankfull Mean Depth (ft)		1.3			1	2.0			2.1		0.9			1.2		1
Bankfull Max Depth (ft)		2.0			1	2.7			2.8		1.4			2.1		1
Bankfull Cross-Sectional Area (ft^2)		7.3			1	62.5			68.8		9.1			12.6		1
Width/Depth Ratio		4.1			1	13.9			17.5		11.1			8.3		1
Entrenchment Ratio		13			1	1.3			2.2		>1.8			2.7		1
Bank Height Ratio		1.8			1						1.0			1.0		1
Pattern																
Channel Beltwidth (ft)						100			400		45	65	47	66	85	5
Radius of Curvature (ft)						70			220		30	80	31	55	65	8
Rc:Bankfull width (ft/ft)						2.2			12.5		3.0	8.0	3.0	5.4	6.4	
Meander Wavelength (ft)						140			500		50	200	166	260	420	7
Meander Width Ratio						3			14		4	10	4.6	6.5	8.3	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)						0.007			0.027							
Pool Length (ft)																
Pool Spacing (ft)						115			400							
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	100% / - / - / - / - / -					- / 11% / 89% / - / - / -							7% / 85% / 8% / - / - / -			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.062 / 0.1 / 0.1 / 0.1					2.6 / 5.7 / 7.1 / - / 15.0							0.15 / 0.36 / 0.54 / 1.1 / 6.0			
Additional Reach Parameters																
Channel length (ft)	1,224										1,265		1,226			
Drainage Area (SM)	0.20					6.00					0.20		0.20			
Rosgen Classification	E5					B4c					B5c		B5c			
Sinuosity	1.00					1.10					1.03		1.06			
Water Surface Slope (ft/ft)	0.0067					0.0084					0.0067		0.0067			
BF slope (ft/ft)											0.0067		0.0068			

Table VI b. Reach 2 Baseline Stream Summary
Harrell Stream and Wetland Restoration

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-Built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	5.7	6.1		6.5	2	13.6	15.7		17.8	2	10.0		9.2	10.2	11.5	3
Floodprone Width (ft)	>65			>70	2	325	463		600	2	>30		56	>59	>67	3
Bankfull Mean Depth (ft)	1.2	1.25		1.3	2	1.5	1.6		1.7	2	1.1		1.0	1.1	1.1	3
Bankfull Max Depth (ft)	1.9	1.9		1.9	2	2.6	2.8		3.0	2	1.4		1.6	1.7	1.9	3
Bankfull Cross-Sectional Area (ft^2)	7.5	7.75		8	2	22.6	24.4		26.2	2	11.2		8.8	10.5	12.5	3
Width/Depth Ratio	4.3	4.8		5.3	2	8.2	10.1		11.9	2	9.1		9.3	9.8	10.6	3
Entrenchment Ratio	10.8	11.1		11.4	2	23.8	28.8		33.7	2	>3.0		4.8	5.9	6.8	3
Bank Height Ratio	1.4	1.6		1.8	2	1.0	1.0		1.0	2	1.0		1.0	1.0	1.0	3
Pattern																
Channel Beltwidth (ft)							158				45	60	24	32	41	8
Radius of Curvature (ft)						37	158		40		30	50	30	36	43	14
Rc:Bankfull width (ft/ft)						2.1			2.3		3.0	5.0	2.9	3.5	4.2	
Meander Wavelength (ft)						94			143		100	200	125	157	186	8
Meander Width Ratio							8.9				4.0	10.0	2.4	3.1	4.0	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)																
Pool Length (ft)																
Pool Spacing (ft)																
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	88% / 12% / - / - / - / -					11% / 89% / - / - / - / -							3% / 81% / 16% / - / - / -			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.062 / 0.1 / - / -					0.075 / 0.14 / 0.2 / 0.4 / 0.6							0.3 / 0.7 / 0.9 / 3.5 / 9.8			
Additional Reach Parameters																
Channel length (ft)	1,400										1,465		1,465			
Drainage Area (SM)	0.23					3.04					0.23		0.23			
Rosgen Classification	E5					C5					C5		C5			
Sinuosity	1.00					1.28					1.05		1.07			
Water Surface Slope (ft/ft)	0.0023					0.0024					0.0023		0.0021			
BF slope (ft/ft)											0.0023		0.0022			

Table VI c. Reach 3 Baseline Stream Summary
Harrell Stream and Wetland Restoration

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	6.4	7.6	7.7	8.6	4	13.6	15.7		17.8	2	12.0		11.8	12.8	14.1	4
Floodprone Width (ft)	>65			>80	4	325	463		600	2	>30		>50	>57	>61	4
Bankfull Mean Depth (ft)	1.4	1.6	1.5	1.9	4	1.5	1.6		1.7	2	1.4		1.2	1.3	1.4	4
Bankfull Max Depth (ft)	2.4	2.7	2.7	2.8	4	2.6	2.8		3.0	2	2.0		1.9	2.1	2.5	4
Bankfull Cross-Sectional Area (ft^2)	10.4	11.6	12.0	12.1	4	22.6	24.4		26.2	2	16.8		14.4	16.2	19.1	4
Width/Depth Ratio	3.3	5.0	5.3	6.2	4	8.2	10.1		11.9	2	8.6		8.9	10.1	10.8	4
Entrenchment Ratio	7.6	9.5	9.8	10.9	4	23.8	28.8		33.7	2	>2.5		3.8	4.5	5.0	4
Bank Height Ratio	1.5	1.6	1.6	1.7	4	1.0	1.0		1.0	2	1.0		1.0	1.0	1.0	4
Pattern																
Channel Beltwidth (ft)							158				60	100	41	70	107	11
Radius of Curvature (ft)						37	158		40		40	60	21	35	46	13
Rc:Bankfull width (ft/ft)						2.1			2.3		3.0	5.0	1.6	2.7	3.6	
Meander Wavelength (ft)						94			143		120	240	158	183	225	11
Meander Width Ratio							8.9				4.0	10.0	3.2	5.5	8.4	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)																
Pool Length (ft)																
Pool Spacing (ft)																
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	65% / 35% / - / - / - / -					11% / 89% / - / - / - / -							7% / 81% / 12% / - / - / -			
d16 / d35 / d50 / d84 / d95	0.062 / 0.062 / 0.1 / - / -					0.075 / 0.14 / 0.2 / 0.4 / 0.6							0.2 / 0.5 / 0.8 / 1.9 / 5.9			
Additional Reach Parameters																
Channel length (ft)	1,225										1,560		1,491			
Drainage Area (SM)	0.42					3.04					0.42		0.42			
Rosgen Classification	E5					C5					C5		C5			
Sinuosity	1.00					1.28					1.27		1.23			
Water Surface Slope (ft/ft)	0.0023					0.0024					0.0023		0.0042			
BF slope (ft/ft)											0.0023		0.0042			

Table VI d. Reach 4 Baseline Stream Summary
Harrell Stream and Wetland Restoration

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	8.4	9.5	9.6	10.4	3	13.6	15.7		17..8	2	13.4		13.1	14.2	16.5	5
Floodprone Width (ft)	>65			>70	3	325	463		600	2	>30		>57	>61	>67	5
Bankfull Mean Depth (ft)	1.1	1.5	1.2	2.2	3	1.5	1.6		1.7	2	1.6		1.3	1.4	1.7	5
Bankfull Max Depth (ft)	1.7	2.5	2.7	3.0	3	2.6	2.8		3.0	2	2.3		2.0	2.2	2.5	5
Bankfull Cross-Sectional Area (ft^2)	10.4	13.8	12.7	18.4	3	22.6	24.4		26.2	2	21.6		17.9	20.5	28.2	5
Width/Depth Ratio	3.8	7.0	8.5	8.8	3	8.2	10.1		11.9	2	8.4		8.8	9.9	10.8	5
Entrenchment Ratio	7.1	7.2	7.2	7.3	3	23.8	28.8		33.7	2	>2.2		3.6	4.4	5.0	5
Bank Height Ratio	0.9	1.0	1.0	1.2	3	1.0	1.0		1.0	2	1.0		1.0	1.0	1.0	5
Pattern																
Channel Beltwidth (ft)							158				50	90	32	59	101	18
Radius of Curvature (ft)						37	158		40		40	70	30	50	63	17
Rc:Bankfull width (ft/ft)						2.1			2.3		3.0	5.0	2.1	3.5	4.0	
Meander Wavelength (ft)						94			143		130	260	196	233	300	18
Meander Width Ratio							8.9				4.0	10.0	2.3	4.2	7.1	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)																
Pool Length (ft)																
Pool Spacing (ft)																
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	50% / 16% / 34% / - / - / -					11% / 89% / - / - / - / -							7.8% / 77.2% / 15% / - / -			
d16 / d35 / d50 / d84 / d95	0.062 / 0.062 / 0.062 / 3.1 / 4.3					0.075 / 0.14 / 0.2 / 0.4 / 0.6							0.6 / 1.1 / 1.3 / 2.4 / 5.0			
Additional Reach Parameters																
Channel length (ft)	2,500										2,697		2,696			
Drainage Area (SM)	0.61					3.04					0.605		0.605			
Rosgen Classification	E5					C5					C5		C5			
Sinuosity	1.00					1.28					1.08		1.10			
Water Surface Slope (ft/ft)	0.0023					0.0024					0.0023		0.0025			
BF slope (ft/ft)											0.0023		0.0021			

Table VII. Morphology and Hydraulic Monitoring Summary
Harrell Stream and Wetland Restoration

Parameter	Cross-Section 1 Reach 1						Cross-Section 2 Reach 1						Cross-Section 3 Reach 2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	10.2	10.4	10.5	10.8			12.4	12.7	13.4	13.4			11.5	13.1	12.4	12.8		
Floodprone Width (ft)	22	27	30	31			25	25	24	20			>55	>55	>55	>55		
Bankfull Cross-Sectional Area (ft^2)	12.6	13.4	14.3	14.0			17.1	12.9	14.3	12.3			12.5	12.6	11.9	12.6		
Bankfull Mean Depth (ft)	1.2	1.3	1.4	1.3			1.4	1.0	1.1	0.9			1.1	1.0	1.0	1.0		
Bankfull Maximum Depth (ft)	2.1	2.1	2.1	2.1			2.2	1.7	1.8	1.3			1.9	1.9	1.9	1.9		
Width/Depth Ratio	8.3	8.1	7.7	8.3			9.0	12.5	12.6	14.5			10.6	13.7	12.9	13.5		
Entrenchment Ratio	2.7	2.6	2.9	2.9			2.8	2.0	1.9	1.5			>4.4	>4.3	>4.6	>4.3		
Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Wetted Perimeter (ft)	11.2	11.5	11.6	11.9			13.3	13.6	14.2	13.9			12.2	13.9	13.0	13.5		
Hydraulic Radius (ft)	1.1	1.2	1.2	1.2			1.3	0.9	1.0	0.9			1.0	0.9	0.9	0.9		
Substrate																		
d50 (mm)	0.5	1.8	0.1	0.8			1.1	1.8	0.1	1.4			0.6	2.3	0.4	0.8		
d84 (mm)	1.1	14.0	1.8	6.4			1.8	5.3	0.9	1.8			1.4	4.3	1.3	1.3		

Table VII. cont. Morphology and Hydraulic Monitoring Summary
Harrell Stream and Wetland Restoration

Parameter	Cross-Section 4 Reach 2						Cross-Section 5 Reach 2						Cross-Section 6 Reach 3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	9.8	11.5	8.8	9.3			9.2	9.9	8.2	9.2			14.1	15.0	13.4	12.9		
Floodprone Width (ft)	>67	>67	>67	>67			56	56	57	60			>56	>56	>56	>56		
Bankfull Cross-Sectional Area (ft^2)	10.3	10.8	8.1	8.8			8.8	10.2	8.8	10.7			19.1	20.8	18.6	19.5		
Bankfull Mean Depth (ft)	1.1	0.9	0.9	0.9			1.0	1.0	1.1	1.2			1.4	1.4	1.4	1.5		
Bankfull Maximum Depth (ft)	1.7	1.7	1.5	1.6			1.6	2.0	1.8	2.1			2.5	2.7	2.6	2.7		
Width/Depth Ratio	9.3	12.2	9.6	9.9			9.6	9.7	7.6	7.8			10.4	10.8	9.7	8.5		
Entrenchment Ratio	>7.0	>7.0	>7.0	>7.0			6.1	5.7	7.0	6.6			>4.0	>3.7	>4.2	>4.3		
Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Wetted Perimeter (ft)	10.7	12.2	9.4	9.9			10.0	10.9	9.3	10.3			15.2	16.3	14.7	14.4		
Hydraulic Radius (ft)	1.0	0.9	0.9	0.9			0.9	0.9	0.9	1.0			1.3	1.3	1.3	1.4		
Substrate																		
d50 (mm)	1.3	3.4	0.1	0.1			0.9	0.8	0.1	0.1			0.6	0.2	0.1	0.1		
d84 (mm)	4.4	6.2	1.2	0.2			4.6	3.8	0.3	0.1			2.0	7.7	1.0	0.1		

Table VII. cont. Morphology and Hydraulic Monitoring Summary
Harrell Stream and Wetland Restoration

Parameter	Cross-Section 7 Reach 3						Cross-Section 8 Reach 3						Cross-Section 9 Reach 3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	12.1	12.0	13.0	12.4			13.0	11.9	11.0	11.2			11.8	12.4	11.9	11.6		
Floodprone Width (ft)	>61	>61	>61	>61			>50	>50	>50	>50			>58	>58	>58	>58		
Bankfull Cross-Sectional Area (ft^2)	14.4	16.2	18.5	18.2			15.6	15.8	13.2	11.2			15.6	15.2	14.3	14.4		
Bankfull Mean Depth (ft)	1.2	1.4	1.4	1.5			1.2	1.3	1.2	1			1.3	1.2	1.2	1.2		
Bankfull Maximum Depth (ft)	1.9	2.6	2.8	2.8			1.9	2.0	1.8	1.5			2.0	2.0	1.9	1.9		
Width/Depth Ratio	10.2	8.8	9.1	8.4			10.8	8.9	9.2	10.4			8.9	10.1	9.9	9.3		
Entrenchment Ratio	>5.0	>5.0	>5.0	>4.9			>4.0	>5.0	>5.0	>4.6			>5.0	>5.0	>5.0	>5.0		
Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Wetted Perimeter (ft)	12.8	13.2	14.3	14.0			14.0	12.8	11.9	11.5			12.8	13.2	12.7	12.4		
Hydraulic Radius (ft)	1.1	1.2	1.3	1.3			1.1	1.2	1.1	1.0			1.2	1.2	1.1	1.2		
Substrate																		
d50 (mm)	0.8	0.7	0.1	0.1			1.0	1.0	1.1	0.1			0.9	0.8	0.6	0.1		
d84 (mm)	2.0	7.3	0.7	0.1			1.9	5.5	3.2	0.1			1.7	1.7	1.0	0.1		

Table VII. cont. Morphology and Hydraulic Monitoring Summary
Harrell Stream and Wetland Restoration

Parameter	Cross-Section 10 Reach 4						Cross-Section 11 Reach 4						Cross-Section 12 Reach 4					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	13.5	13.9	12.7	13.1			14.0	13.3	12.8	12.7			16.8	17.6	16.1	16.9		
Floodprone Width (ft)	>67	>67	>67	>67			>57	>57	>57	>57			>61	>61	>61	>61		
Bankfull Cross-Sectional Area (ft^2)	17.9	16.9	14.2	14.0			18.2	18.7	18.0	17.1			28.2	27.2	23.4	24.7		
Bankfull Mean Depth (ft)	1.3	1.2	1.1	1.1			1.3	1.4	1.4	1.3			1.7	1.5	1.5	1.5		
Bankfull Maximum Depth (ft)	2.0	2.0	1.8	1.7			2.1	2.3	2.2	2.1			2.5	2.5	2.2	2.3		
Width/Depth Ratio	10.2	11.5	11.4	12.3			10.8	9.5	9.1	9.4			10.0	11.4	11.1	11.6		
Entrenchment Ratio	>5.0	>5.0	>5.0	>5.0			>4.0	>4.0	>4.0	>4.0			>4.0	>4.0	>4.0	>4.0		
Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Wetted Perimeter (ft)	14.3	14.7	13.3	13.7			15.0	14.4	13.9	13.6			17.8	18.7	17.1	18.0		
Hydraulic Radius (ft)	1.2	1.2	1.1	1.0			1.2	1.3	1.3	1.3			1.6	1.5	1.4	1.4		
Substrate																		
d50 (mm)	1.0	2.0	0.1	0.1			1.4	1.6	0.1	0.3			1.4	0.9	1.3	0.1		
d84 (mm)	2.6	4.2	3.0	0.1			2.0	5.9	1.6	0.6			3.0	2.7	2.8	0.1		

Table VII. cont. Morphology and Hydraulic Monitoring Summary
Harrell Stream and Wetland Restoration

Parameter	Cross-Section 13 Reach 4						Cross-Section 14 Reach 4					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	13.1	13.4	13.3	13.3			13.6	14.0	13.8	14.2		
Floodprone Width (ft)	>60	>60	>60	>60			>62	>62	>62	>62		
Bankfull Cross-Sectional Area (ft^2)	19.4	20.0	18.4	18.5			19.0	20.5	19.1	20.3		
Bankfull Mean Depth (ft)	1.5	1.5	1.4	1.4			1.4	1.5	1.4	1.4		
Bankfull Maximum Depth (ft)	2.4	2.3	2.3	2.1			2.1	2.3	2.2	2.2		
Width/Depth Ratio	8.8	8.9	9.6	9.6			9.7	9.6	10.0	9.9		
Entrenchment Ratio	>4.0	>4.0	>4.0	>4.0			>4.0	>4.0	>4.0	>4.0		
Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Wetted Perimeter (ft)	14.1	14.3	14.4	14.3			14.5	15.1	15.6	15.2		
Hydraulic Radius (ft)	1.4	1.4	1.3	1.3			1.3	1.4	1.2	1.3		
Substrate												
d50 (mm)	1.5	1.6	1.1	0.7			1.3	0.1	0.1	0.6		
d84 (mm)	2.6	4.7	1.8	0.9			1.8	0.4	0.1	0.9		

2.3 Wetland Assessment

The maximum number of consecutive days that the groundwater was within 12 inches of the surface was determined for each groundwater gauge. This number was converted into a percentage of the 223-day growing season. Table 5 presents the hydrological monitoring results for 2010. The wetland wells used to monitor site hydrology were installed in the spring of 2007. During the third year of monitoring wetland hydrology was achieved at all of the wells on the site (Table 5). Based on these data, the site has exceeded the minimum duration of 12 consecutive days with the water table within 12 inches of the soil surface for the 2010 growing season (Appendix B). Climatic data for the 2010 growing season were analyzed in comparison to historical data to determine whether 2010 was a normal year in terms of climatic conditions. The historical data were collected from the NRCS, Water and Climate Center, "Climate Analysis for Wetlands by County" website. This evaluation concluded that 2010 was a normal year for rainfall during the growing season. Rainfall was within the 30th to 70th percentiles for the months of January, February, March, July, August, September, and October. Rainfall was less than the 30th percentile threshold in April, June and November, and was greater than the 70th percentile threshold in May. (Appendix B).

2.3.1 Wetland Criteria Attainment Tables

Table VIIIa. Hydrologic Monitoring Results
Project Name: Harrell Stream and Wetland Restoration

	Hydroperiod						
Well #	<5%	5% - 8%	8% - 12.5%	>12.5%	Actual %	Max. No. of Consecutive Days	Dates Meeting Success
1			X		8.1%	18	3/20/10-4/6/10
2			X		9.4%	21	3/20/10-4/10/10
3			X		8.5%	19	3/20/10-4/7/10
4			X		8.5%	19	3/20/10-4/8/10

Table VIIIb. Hydroperiod History
Harrell Stream and Wetland Restoration

Well #	Pre-Restoration	Year 1	Year 2	Year 3	Year 4	Year 5
1	<5%	6.8%	9.8%	8.1%		
2	<5%	16.5%	12.4%	9.4%		
3	<5%	6.8%	9.8%	8.5%		
4	<5%	13.7%	12.0%	8.5%		

3.0 SUCCESS CRITERIA

The stream is functioning as designed and has not developed any significant problems. The changes that are visible in the monitored cross-sections and profiles indicate adjustment of the stream due to its sand bed. Any feature changes will be tracked to see if the stream is moving beyond its expected variability. With multiple bankkfull events since construction, the stream is on track to meeting the success criterion of at least two bankfull events occurring in separate years over the course of the monitoring period.

The hydrology data in Section 2.3 indicates that the wetland is on track to meeting the success criterion of having the groundwater continuously within 12" of the ground surface for 5% of the growing season.

The planted vegetation has been doing well, with some plots experiencing more mortality than others. This mortality can be attributed to normal losses after the initial planting as well as to the effects of a drought soon after planting. The low planted stem density areas on the stream floodplain are mostly

caused by the poor soil quality in these areas. With more organic material accumulating in the soil since construction, the supplemental planting of the stream area this winter should have better survival rates than the originally planted trees. Some invasive species have been identified on the site, which include Chinese lespedeza (*Lespedeza cuneata*), Japanese honeysuckle *(Lonicera japonica*), tropical soda apple (*Solanum viarium*) and Asian dayflower (*Murdannia keisak*). The exotic vegetation is not widespread across the project, but these populations will continue to be monitored to determine if control measures will be required in the future. The vegetation is on track to meeting the success criteria in the steam and wetland for the third year of monitoring.

Appendix A
Vegetation Data

Table A1. Riparian Buffer Stem Density and Species Count by Plot
Harrell Stream and Wetland Restoration

Plot Number	River Birch *Betula nigra*	American Beautyberry *Callicarpa americana*	Shagbark Hickory *Carya ovata*	Sugarberry *Celtis laevigata*	Silky Dogwood *Cornus amomum*	Persimmon *Diospyros viginiana*	Green Ash *Fraxinus pennsylvanica*	Sycamore *Platanus occidentalis*	Southern Red Oak *Quercus falcata*	Swamp Chestnut Oak *Quercus michauxii*	Willow Oak *Quercus phellos*	Black Willow *Salix nigra*	Elderberry *Sambucus canadensis*	Bald Cypress *Taxodium distichum*	Cherrybark Oak *Quercus pagoda*	Total (Year 3)	Density-Year 3 (Stems/Acre)
S1					6				3		2					11	440
S2		4	3						1						1	9	360
S3		2	1		5	6					1		5		1	21	840
S4	1	2		4						3	3					13	520
S5	4			1	8					4	2		1			20	800
S6	1	2								4						7	280
S7		7		3	7				1	3	4		2			27	1,080
S8		5									1					6	240
S9	4			1	4	5				2	4	2				22	880
S10		1		1		1		4			2					9	360
S11		4		2	6	2			1	2	1	1	1			20	800
S12	5	1		1				2								9	360
S13		4		6	2		1	1		4						18	720
S14	2	2				7				2						13	520
S15	4	4		3	9			3		1						24	960
S16	1	4				1		1		5						12	480
S17				1		1	3			3				2		10	400
S18	4			4			8				2					18	720
															Average Density		598

Table A2. Wetland Stem Density and Species Count by Plot
Harrell Stream and Wetland Restoration

Plot Number	**Green Ash** *Fraxinus pennsylvanica*	**American Beautyberry** *Callicarpa americana*	**Water Hickory** *Carya aquatica*	**Buttonbush** *Cephalanthus occidentalis*	**Cherrybark Oak** *Quercus pagoda*	**Swamp Chestnut Oak** *Quercus michauxii*	**Willow Oak** *Quercus phellos*	**Laurel Oak** *Quercus laurifolia*	**Bald Cypress** *Taxodium distichum*	**Total (Year 3)**	**Density-Year 3 (Stems/Acre)**
W1	4	1		1	2	1		1		10	400
W2				1	5		2	1		9	360
W3				1	1	1			6	9	360
W4	2	1		4	4	1	2	2		16	640
W5	4				1	4			4	13	520
W6				5			5	2	3	15	600
W7					1	3	4			8	320
W8			8	4	1				3	16	640
W9	2	1		1	4	1	1	3		13	520
W10	3			4	2			4	1	14	560
W11		1	3	4					6	14	560
W12			5	4		1			9	19	760
										Average Density	533

Table A3. Riparian Buffer Vegetation History (stems/acre)
Harrell Stream and Wetland Restoration

Plot Number	MY-00	MY-01	MY-02	MY-03	MY-04	MY-05
S1	1,120	640	560	440		
S2	720	360	400*	360		
S3	1,120	880	880	840		
S4	480	560*	560	520		
S5	1,200	840	800	800		
S6	480	280	280	280		
S7	1,120	1,120	1,120	1,080		
S8	480	320	240	240		
S9	1,240	920	920	880		
S10	600	360	360	360		
S11	880	760	800*	800		
S12	600	440	360	360		
S13	1,160	840	800	720		
S14	640	520	520	520		
S15	1,120	1,000	960	960		
S16	600	480	480	480		
S17	880	200	200	400**		
S18	680	320	280	720**		

*Uncounted plants during baseline and MY01 were added to total

** Includes plants from supplemental planting

Table A4. Wetland Vegetation History (stems/acre)
Harrell Stream and Wetland Restoration

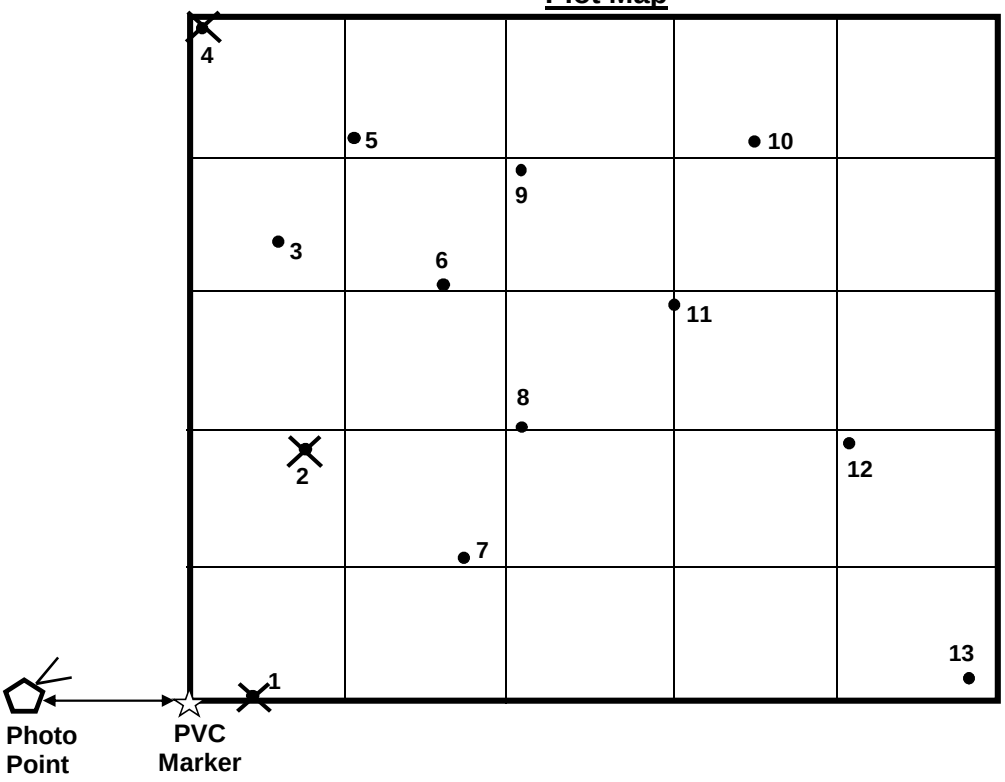
Plot Number	MY-00	MY-01	MY-02	MY-03	MY-04	MY-05
W1	520	400	400	400		
W2	640	360	360	360		
W3	600	400	400	360		
W4	800	640	640	640		
W5	600	560	560	520		
W6	720	600	600	600		
W7	680	240	240	320		
W8	760	680	680	640		
W9	640	560	560	520		
W10	600	600	600	560		
W11	680	560	560	560		
W12	1,080	800	800	760		

Vegetation Monitoring Data Sheets

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W1 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Bald Cypress (*Taxodium distichum*)			Dead
2	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
3	Green Ash (*Fraxinus pennsylvanica*)	1.00	4	Deer browse
4	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.18	4	
6	Green Ash (*Fraxinus pennsylvanica*)	0.65	3	Deer browse, main stem died back
7	Buttonbush (*Cephalanthus occidentalis*)	0.41	2	Deer browse
8	Green Ash (*Fraxinus pennsylvanica*)	0.85	3	Deer browse
9	Laurel Oak (*Quercus laurifolia*)	1.59	4	
10	Cherrybark Oak (*Quercus pagoda*)	0.75	4	
11	Laurel Oak (*Quercus laurifolia*)	1.22	4	
12	American Beautyberry (*Callicarpa americana*)	-	1	Stem dead; check for resprout
13	Green Ash (*Fraxinus pennsylvanica*)	0.77	3	Main stem died back

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	10.0%
Green Ash (*Fraxinus pennsylvanica*)	40.0%
Buttonbush (*Cephalanthus occidentalis*)	10.0%
Laurel Oak (*Quercus laurifolia*)	10.0%
Cherrybark Oak (*Quercus pagoda*)	20.0%
American Beautyberry (*Callicarpa americana*)	10.0%

Density:

Total Number of Trees **10** / **0.025 acres** = **400** **trees / acre**

Survivability:

Total Number of Trees **10** / **13 trees** x **100** = **77** **% survivability**

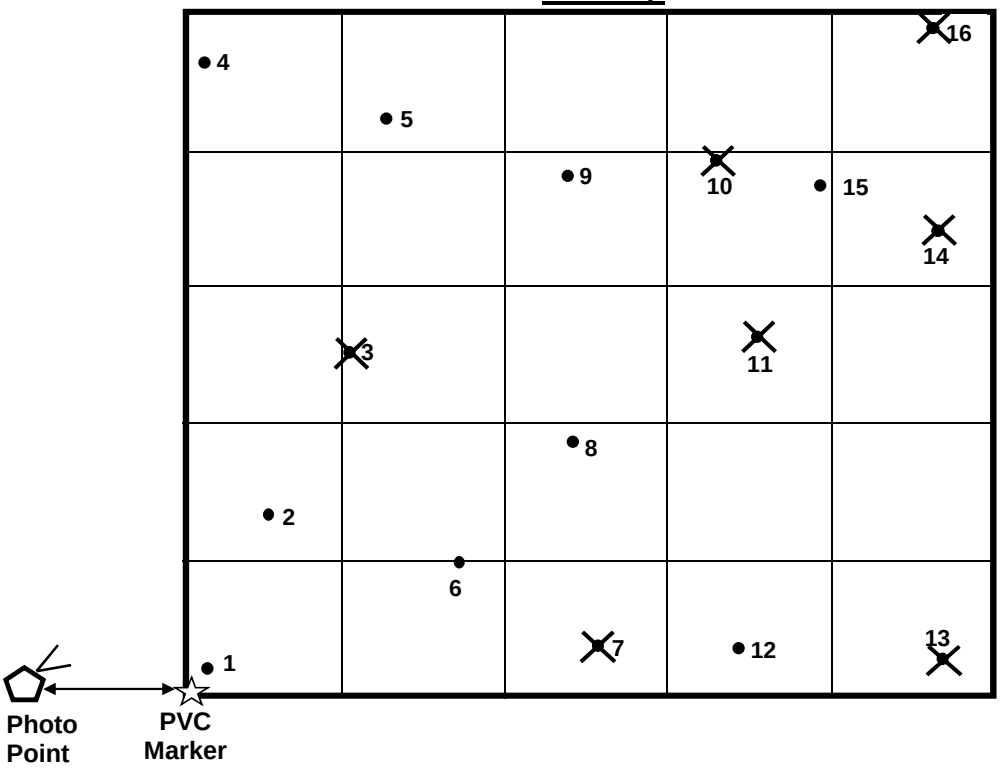
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W2 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Willow Oak (*Quercus phellos*)	0.61	3	
2	Laurel Oak (*Quercus laurifolia*)	1.06	4	
3	Unknown			Dead
4	Willow Oak (*Quercus phellos*)	2.30	4	
5	Cherrybark Oak (*Quercus pagoda*)	0.66	4	
6	Cherrybark Oak (*Quercus pagoda*)	0.62	3	
7	Cherrybark Oak (*Quercus pagoda*)			Dead
8	Cherrybark Oak (*Quercus pagoda*)	2.01	4	
9	Cherrybark Oak (*Quercus pagoda*)	0.65	4	Deer browse
10	Unknown			Dead
11	Unknown			Dead
12	Buttonbush (*Cephalanthus occidentalis*)	1.22	4	
13	Unknown			Dead
14	Unknown			Dead
15	Cherrybark Oak (*Quercus pagoda*)	0.43	3	
16	Unknown			Dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

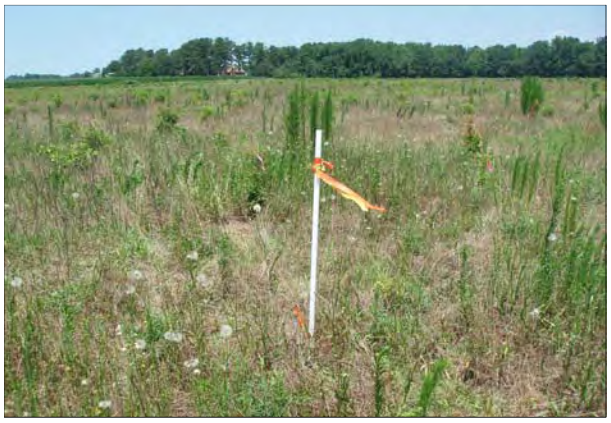
Species	Percent of Total
Willow Oak (*Quercus phellos*)	22.2%
Cherrybark Oak (*Quercus pagoda*)	55.6%
Buttonbush (*Cephalanthus occidentalis*)	11.1%
Laurel Oak (*Quercus laurifolia*)	11.1%

Density:

Total Number of Trees **9** / **0.025 acres** = **360** **trees / acre**

Survivability:

Total Number of Trees **9** / **16 trees** x **100** = **56** **% survivability**



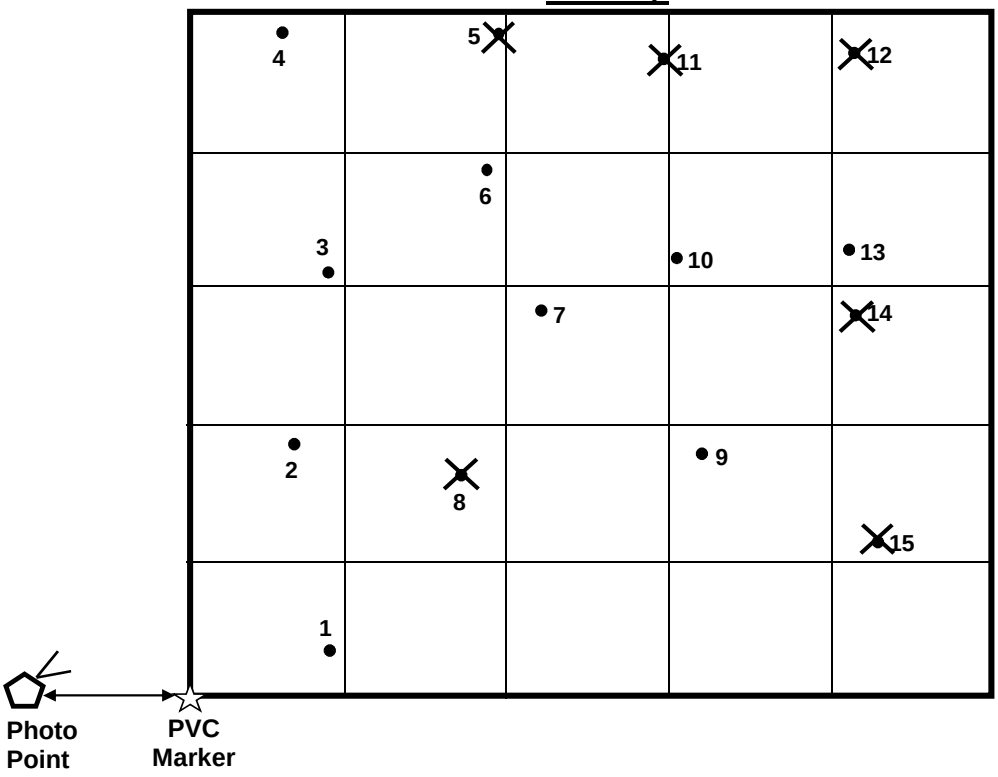
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W3 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Bald Cypress (*Taxodium distichum*)	1.10	4	
2	Buttonbush (*Cephalanthus occidentalis*)	1.58	4	Died back in middle
3	Bald Cypress (*Taxodium distichum*)	2.12	4	
4	Cherrybark Oak (*Quercus pagoda*)	0.95	4	
5	*Quercus sp.*			Dead
6	Bald Cypress (*Taxodium distichum*)	2.25	4	
7	Bald Cypress (*Taxodium distichum*)	2.15	4	
8	Buttonbush (*Cephalanthus occidentalis*)			Dead
9	Bald Cypress (*Taxodium distichum*)	1.72	4	
10	Bald Cypress (*Taxodium distichum*)	2.17	4	
11	Unknown			Dead
12	Unknown			Dead
13	Swamp Chestnut Oak (*Quercus michauxii*)	2.07	4	
14	Buttonbush (*Cephalanthus occidentalis*)			Dead
15	Bald Cypress (*Taxodium distichum*)			Dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Bald Cypress (*Taxodium distichum*)	66.7%
Swamp Chestnut Oak (*Quercus michauxii*)	11.1%
Buttonbush (*Cephalanthus occidentalis*)	11.1%
Cherrybark Oak (*Quercus pagoda*)	11.1%

Density:

Total Number of Trees **9** / **0.025 acres** = **360** **trees / acre**

Survivability:

Total Number of Trees **9** / **15 trees** x **100** = **60** **% survivability**

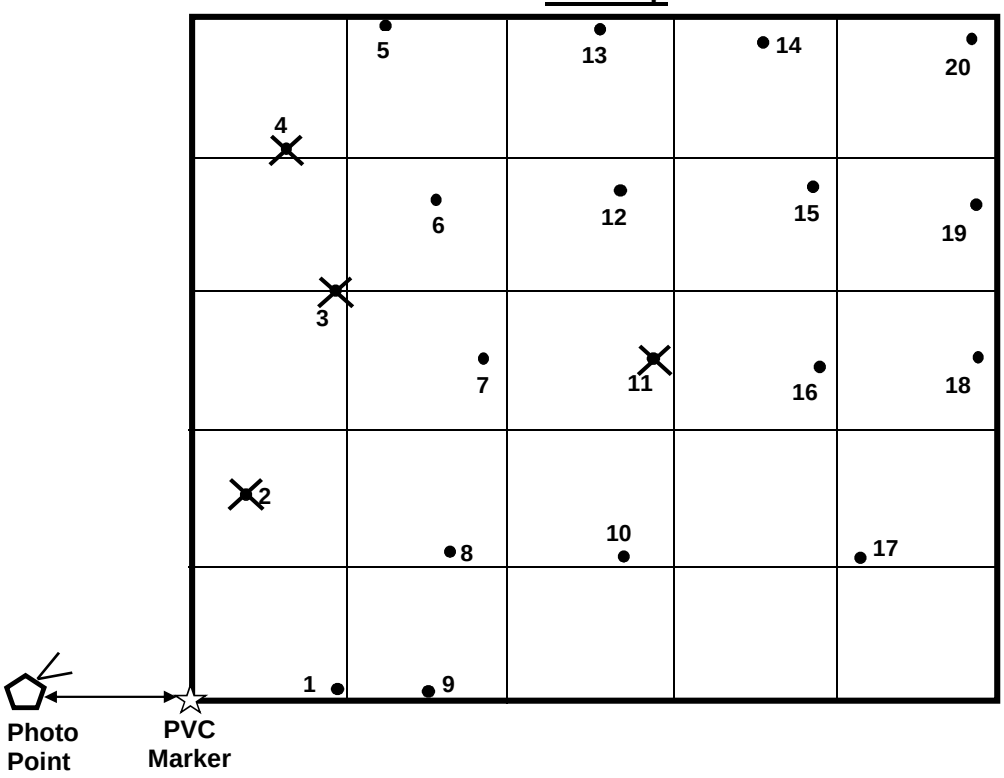
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W4 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Green Ash (*Fraxinus pennsylvanica*)	1.60	4	Fungus
2	Cherrybark Oak (*Quercus pagoda*)			Dead
3	Unknown			Dead
4	Unknown			Dead
5	Buttonbush (*Cephalanthus occidentalis*)	1.89	4	
6	Cherrybark Oak (*Quercus pagoda*)	1.45	4	
7	Buttonbush (*Cephalanthus occidentalis*)	1.61	4	Fungus
8	Cherrybark Oak (*Quercus pagoda*)	1.88	4	
9	Buttonbush (*Cephalanthus occidentalis*)	1.63	4	
10	Laurel Oak (*Quercus laurifolia*)	1.71	4	
11	Unknown			Dead
12	Swamp Chestnut Oak (*Quercus michauxii*)	2.80	4	
13	Laurel Oak (*Quercus laurifolia*)	2.40	4	
14	Willow Oak (*Quercus phellos*)	2.80	4	
15	Cherrybark Oak (*Quercus pagoda*)	1.91	4	
16	Buttonbush (*Cephalanthus occidentalis*)	2.17	4	
17	Cherrybark Oak (*Quercus pagoda*)	2.70	4	
18	Green Ash (*Fraxinus pennsylvanica*)	1.82	4	
19	American Beautyberry (*Callicarpa americana*)	-	1	Stem dead; check for resprout
20	Willow Oak (*Quercus phellos*)	1.88	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Green Ash (*Fraxinus pennsylvanica*)	12.5%
Cherrybark Oak (*Quercus pagoda*)	25.0%
Buttonbush (*Cephalanthus occidentalis*)	25.0%
Laurel Oak (*Quercus laurifolia*)	12.5%
Swamp Chestnut Oak (*Quercus michauxii*)	6.3%
Willow Oak (*Quercus phellos*)	12.5%
American Beautyberry (*Callicarpa americana*)	6.3%

Density:

Total Number of Trees **16** / **0.025 acres** = **640** **trees / acre**

Survivability:

Total Number of Trees **16** / **20 trees** x **100** = **80** **% survivability**

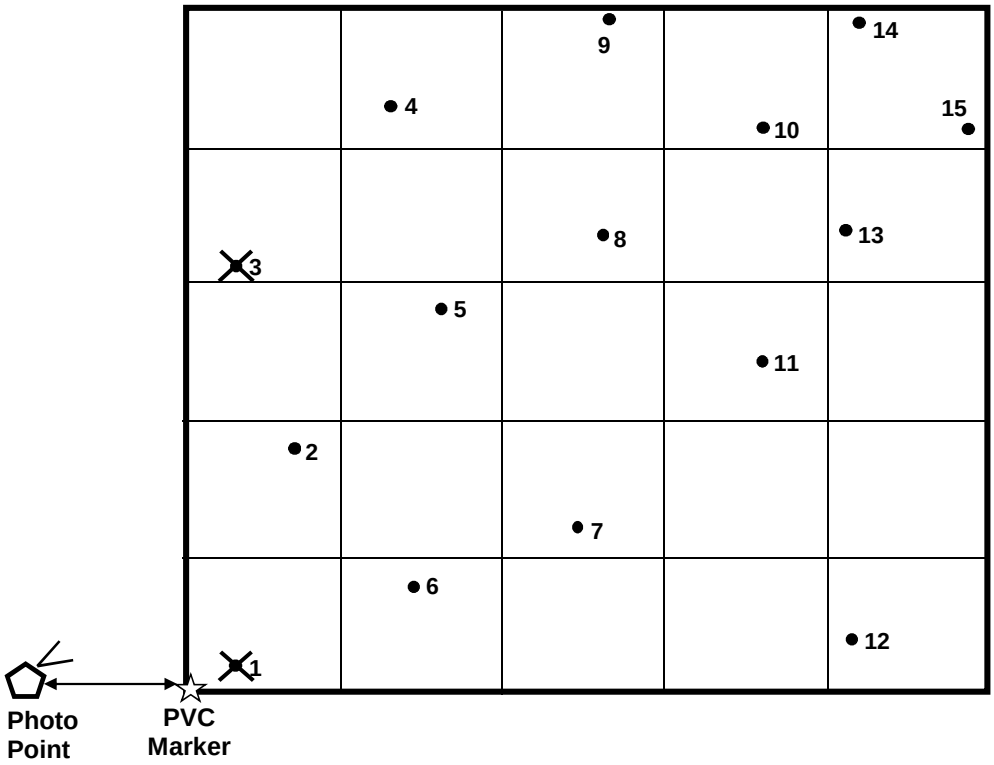
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W5 **Date:** 7/29/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Beautyberry (*Callicarpa americana*)			Dead
2	Bald Cypress (*Taxodium distichum*)	1.31	4	
3	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
4	Swamp Chestnut Oak (*Quercus michauxii*)	1.53	4	
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.70	4	
6	Green Ash (*Fraxinus pennsylvanica*)	1.14	4	
7	Green Ash (*Fraxinus pennsylvanica*)	1.73	4	
8	Bald Cypress (*Taxodium distichum*)	1.39	4	
9	Swamp Chestnut Oak (*Quercus michauxii*)	1.33	4	
10	Swamp Chestnut Oak (*Quercus michauxii*)	1.96	4	
11	Bald Cypress (*Taxodium distichum*)	1.60	4	
12	Green Ash (*Fraxinus pennsylvanica*)	0.78	3	
13	Cherrybark Oak (*Quercus pagoda*)	1.15	4	
14	Bald Cypress (*Taxodium distichum*)	1.25	3	
15	Green Ash (*Fraxinus pennsylvanica*)	1.37	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Bald Cypress (*Taxodium distichum*)	30.8%
Green Ash (*Fraxinus pennsylvanica*)	30.8%
Cherrybark Oak (*Quercus pagoda*)	7.7%
Swamp Chestnut Oak (*Quercus michauxii*)	30.8%

Density:

Total Number of Trees **13** / **0.025 acres** = **520** **trees / acre**

Survivability:

Total Number of Trees **13** / **15 trees** **x** **100** = **87** **% survivability**

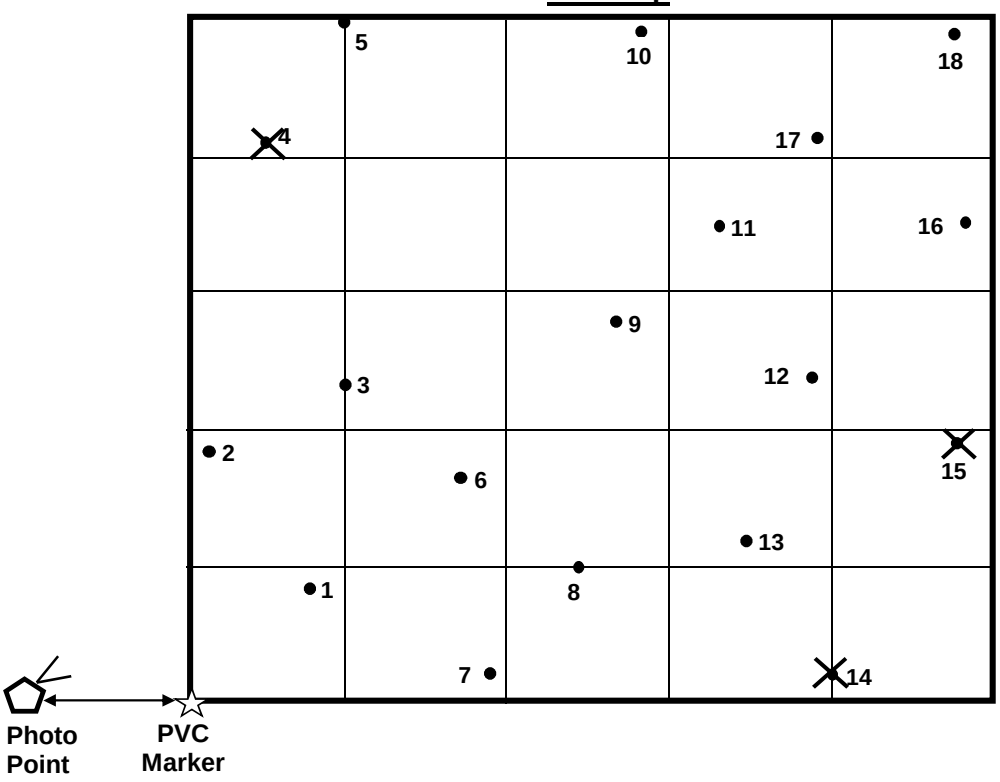
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W6 **Date:** 7/29/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Buttonbush (*Cephalanthus occidentalis*)	1.35	3	Deer browse
2	Willow Oak (*Quercus phellos*)	1.20	3	
3	Bald Cypress (*Taxodium distichum*)	2.00	4	
4	Possumhaw (*Viburnum nudum*)			Dead
5	Bald Cypress (*Taxodium distichum*)	1.26	3	
6	Willow Oak (*Quercus phellos*)	1.90	3	
7	Buttonbush (*Cephalanthus occidentalis*)	1.27	3	
8	Buttonbush (*Cephalanthus occidentalis*)	1.02	3	Deer browse
9	Willow Oak (*Quercus phellos*)	2.25	3	
10	Bald Cypress (*Taxodium distichum*)	1.54	3	
11	Buttonbush (*Cephalanthus occidentalis*)	1.74	4	
12	Laurel Oak (*Quercus laurifolia*)	1.42	3	
13	Buttonbush (*Cephalanthus occidentalis*)	1.41	3	Deer browse, fungus
14	Laurel Oak (*Quercus laurifolia*)			Dead
15	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
16	Laurel Oak (*Quercus laurifolia*)	1.70	4	
17	Willow Oak (*Quercus phellos*)	2.35	4	
18	Willow Oak (*Quercus phellos*)	0.51	3	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

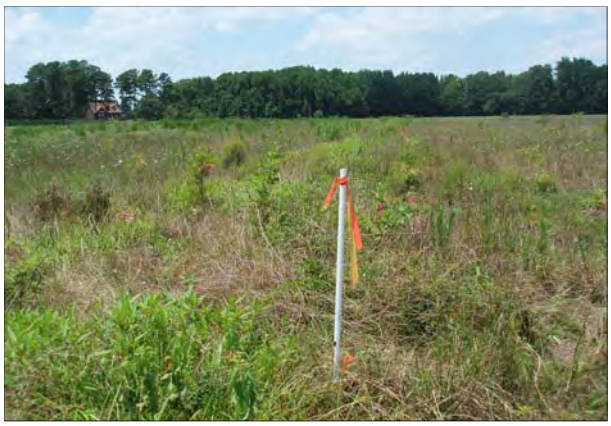
Species	Percent of Total
Bald Cypress (*Taxodium distichum*)	20.0%
Willow Oak (*Quercus phellos*)	33.3%
Laurel Oak (*Quercus laurifolia*)	13.3%
Buttonbush (*Cephalanthus occidentalis*)	33.3%

Density:

Total Number of Trees **15** / **0.025 acres** = **600** **trees / acre**

Survivability:

Total Number of Trees **15** / **18 trees** **x** **100** = **83** **% survivability**



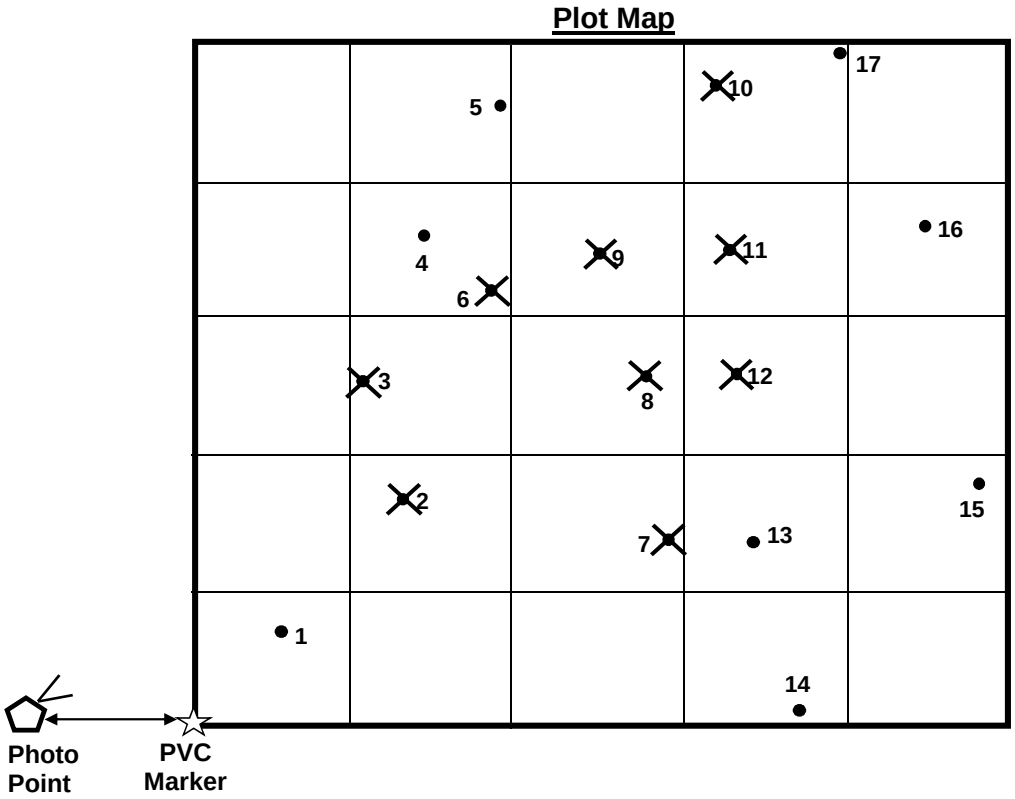
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W7 **Date:** 7/29/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Swamp Chestnut Oak (*Quercus michauxii*)	2.50	4	Deer browse
2	Water Hickory (*Carya aquatica*)			Dead
3	Unknown			Dead
4	Willow Oak (*Quercus phellos*)	2.44	4	
5	Willow Oak (*Quercus phellos*)	1.28	4	
6	Buttonbush (*Cephalanthus occidentalis*)			Dead
7	Unknown			Dead
8	Unknown			Dead
9	Unknown			Dead
10	Unknown			Dead
11	Unknown			Dead
12	Unknown			Dead
13	Willow Oak (*Quercus phellos*)	1.30	4	
14	Willow Oak (*Quercus phellos*)	0.61	3	
15	Swamp Chestnut Oak (*Quercus michauxii*)	1.82	4	
16	Swamp Chestnut Oak (*Quercus michauxii*)	1.89	4	
17	Cherrybark Oak (*Quercus pagoda*)	0.47	2	Top broke off

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Willow Oak (*Quercus phellos*)	50.0%
Swamp Chestnut Oak (*Quercus michauxii*)	37.5%
Cherrybark Oak (*Quercus pagoda*)	12.5%

Density:

Total Number of Trees **8** / **0.025 acres** = **320** **trees / acre**

Survivability:

Total Number of Trees **8** / **17 trees** **x 100** = **47** **% survivability**

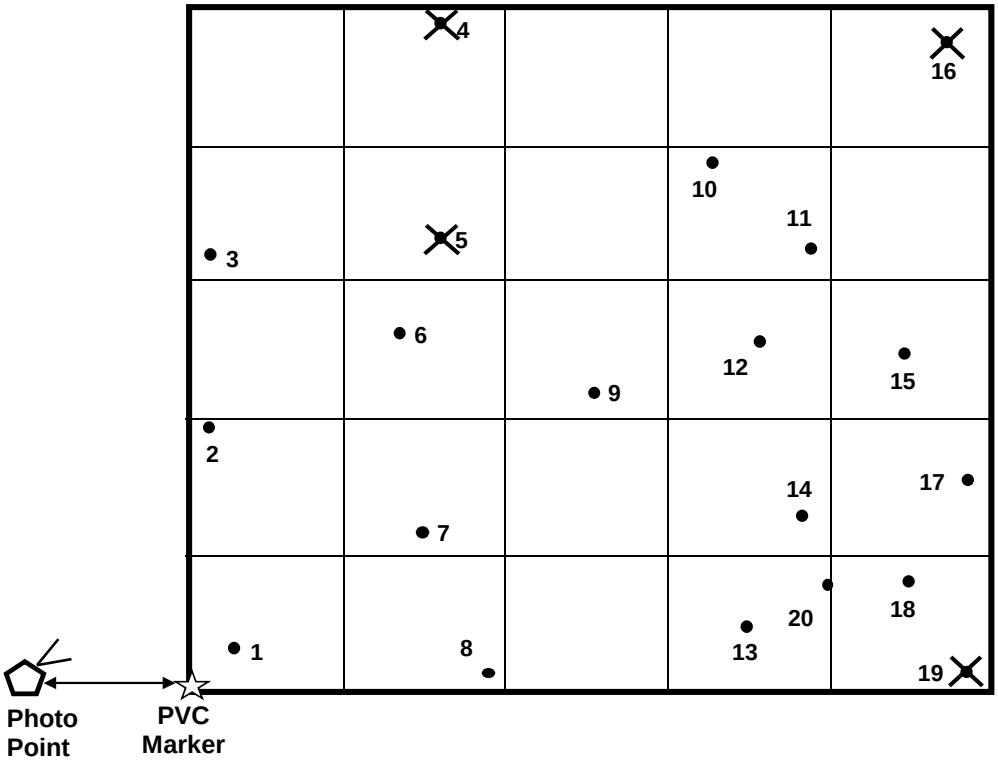
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W8 **Date:** 7/29/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Buttonbush (*Cephalanthus occidentalis*)	0.38	2	
2	Water Hickory (*Carya aquatica*)	0.94	3	Deer browse
3	Water Hickory (*Carya aquatica*)	1.39	4	
4	Unknown			Dead
5	Unknown			Dead
6	Water Hickory (*Carya aquatica*)	0.96	4	
7	Bald Cypress (*Taxodium distichum*)	1.50	4	
8	Water Hickory (*Carya aquatica*)	0.93	4	
9	Bald Cypress (*Taxodium distichum*)	1.35	4	
10	Water Hickory (*Carya aquatica*)	0.94	4	
11	Water Hickory (*Carya aquatica*)	1.18	4	
12	Buttonbush (*Cephalanthus occidentalis*)	1.47	4	
13	Bald Cypress (*Taxodium distichum*)	1.53	4	
14	Water Hickory (*Carya aquatica*)	1.13	4	
15	Buttonbush (*Cephalanthus occidentalis*)	1.45	4	
16	American Beautyberry (*Callicarpa americana*)			Dead
17	Water Hickory (*Carya aquatica*)	0.85	3	Insect damage
18	Buttonbush (*Cephalanthus occidentalis*)	1.95	4	
19	Bald Cypress (*Taxodium distichum*)			Dead
20	Cherrybark Oak (*Quercus pagoda*)	1.72	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Water Hickory (*Carya aquatica*)	50.0%
Bald Cypress (*Taxodium distichum*)	18.8%
Buttonbush (*Cephalanthus occidentalis*)	25.0%
Cherrybark Oak (*Quercus pagoda*)	6.3%

Density:

Total Number of Trees **16** / **0.025 acres** = **640** **trees / acre**

Survivability:

Total Number of Trees **16** / **20 trees** **x** **100** = **80** **% survivability**

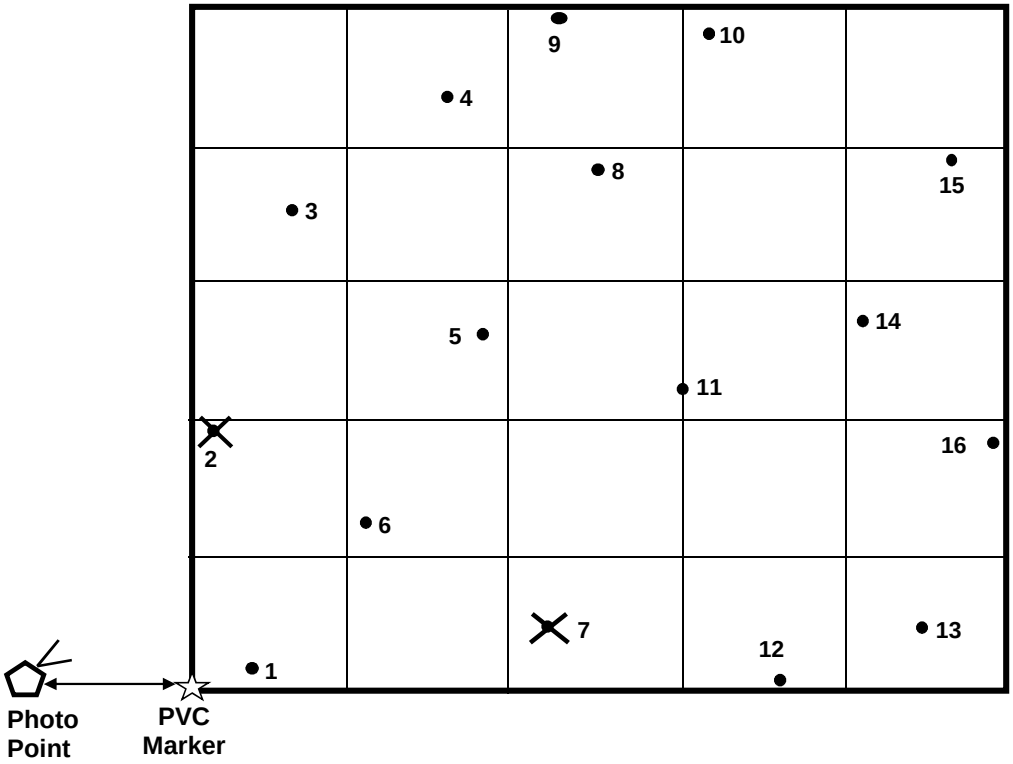
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W9 **Date:** 7/29/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Buttonbush (*Cephalanthus occidentalis*)	2.25	4	
2	Bald Cypress (*Taxodium distichum*)			Dead
3	Cherrybark Oak (*Quercus pagoda*)	2.12	4	
4	American Beautyberry (*Callicarpa americana*)	0.55	2	Stems died back
5	Cherrybark Oak (*Quercus pagoda*)	2.80	4	
6	Swamp Chestnut Oak (*Quercus michauxii*)	2.03	4	
7	Unknown			Dead
8	Cherrybark Oak (*Quercus pagoda*)	2.60	4	
9	American Beautyberry (*Callicarpa americana*)			Missing
10	Cherrybark Oak (*Quercus pagoda*)	1.45	4	
11	Green Ash (*Fraxinus pennsylvanica*)	0.96	3	
12	Laurel Oak (*Quercus laurifolia*)	1.09	4	
13	Laurel Oak (*Quercus laurifolia*)	1.44	4	
14	Green Ash (*Fraxinus pennsylvanica*)	2.00	4	
15	Willow Oak (*Quercus phellos*)	2.11	4	
16	Laurel Oak (*Quercus laurifolia*)	1.54	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Green Ash (*Fraxinus pennsylvanica*)	15.4%
Laurel Oak (*Quercus laurifolia*)	23.1%
Willow Oak (*Quercus phellos*)	7.7%
Cherrybark Oak (*Quercus pagoda*)	30.8%
Swamp Chestnut Oak (*Quercus michauxii*)	7.7%
Buttonbush (*Cephalanthus occidentalis*)	7.7%
American Beautyberry (*Callicarpa americana*)	7.7%

Density:

Total Number of Trees **13** / **0.025 acres** = **520** **trees / acre**

Survivability:

Total Number of Trees **13** / **16 trees** x **100** = **81** **% survivability**

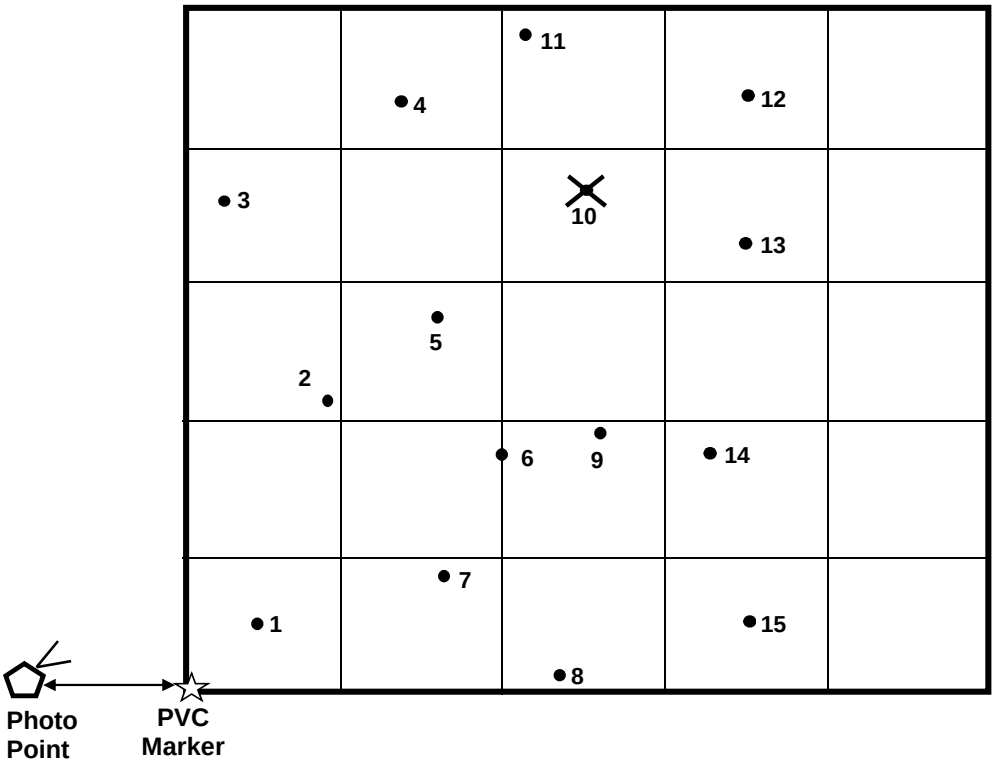
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W10 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Laurel Oak (*Quercus laurifolia*)	1.80	4	
2	Cherrybark Oak (*Quercus pagoda*)	0.53	3	
3	Green Ash (*Fraxinus pennsylvanica*)	0.97	3	Fungus
4	Green Ash (*Fraxinus pennsylvanica*)	1.40	3	Fungus
5	Cherrybark Oak (*Quercus pagoda*)	0.38	3	Resprout
6	Bald Cypress (*Taxodium distichum*)	1.44	4	
7	Laurel Oak (*Quercus laurifolia*)	0.88	4	
8	Laurel Oak (*Quercus laurifolia*)	1.31	4	
9	Laurel Oak (*Quercus laurifolia*)	0.70	3	
10	Laurel Oak (*Quercus laurifolia*)			Dead
11	Green Ash (*Fraxinus pennsylvanica*)	1.12	3	Fungus
12	Buttonbush (*Cephalanthus occidentalis*)	1.64	4	Fungus
13	Buttonbush (*Cephalanthus occidentalis*)	2.06	4	Fungus
14	Buttonbush (*Cephalanthus occidentalis*)	1.25	4	
15	Buttonbush (*Cephalanthus occidentalis*)	1.35	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Laurel Oak (*Quercus laurifolia*)	28.6%
Bald Cypress (*Taxodium distichum*)	7.1%
Green Ash (*Fraxinus pennsylvanica*)	21.4%
Cherrybark Oak (*Quercus pagoda*)	14.3%
Buttonbush (*Cephalanthus occidentalis*)	28.6%

Density:

Total Number of Trees **14** / **0.025 acres** = **560** **trees / acre**

Survivability:

Total Number of Trees **14** / **15 trees** x **100** = **93** **% survivability**

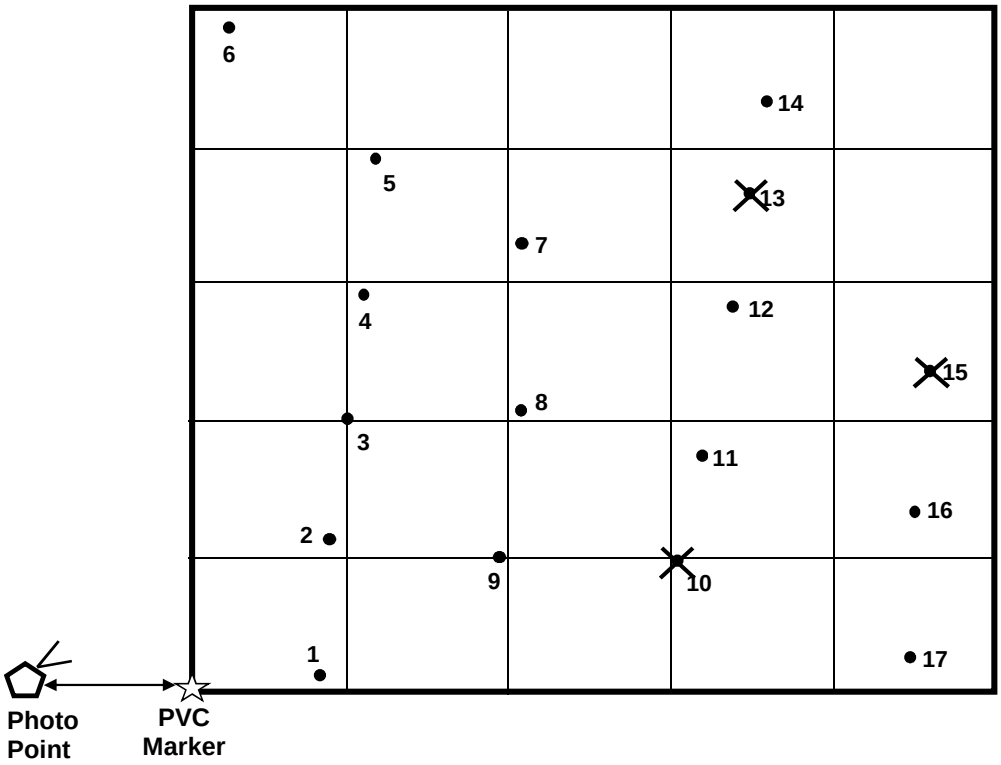
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W11 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Buttonbush (*Cephalanthus occidentalis*)	1.00	3	
2	Buttonbush (*Cephalanthus occidentalis*)	0.43	3	
3	Bald Cypress (*Taxodium distichum*)	2.05	4	
4	Buttonbush (*Cephalanthus occidentalis*)	1.05	3	
5	Buttonbush (*Cephalanthus occidentalis*)	1.02	3	
6	Water Hickory (*Carya aquatica*)	1.98	4	
7	American Beautyberry (*Callicarpa americana*)	0.70	3	
8	Water Hickory (*Carya aquatica*)	1.49	4	
9	Bald Cypress (*Taxodium distichum*)	1.20	4	
10	Bald Cypress (*Taxodium distichum*)			Dead
11	Water Hickory (*Carya aquatica*)	1.07	3	
12	Bald Cypress (*Taxodium distichum*)	1.20	4	
13	Unknown			Dead
14	Bald Cypress (*Taxodium distichum*)	0.94	3	
15	Bald Cypress (*Taxodium distichum*)			Dead
16	Bald Cypress (*Taxodium distichum*)	0.49	3	
17	Bald Cypress (*Taxodium distichum*)	0.81	3	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Bald Cypress (*Taxodium distichum*)	42.9%
Water Hickory (*Carya aquatica*)	21.4%
Buttonbush (*Cephalanthus occidentalis*)	28.6%
American Beautyberry (*Callicarpa americana*)	7.1%

Density:

Total Number of Trees **14** / **0.025 acres** = **560** **trees / acre**

Survivability:

Total Number of Trees **14** / **17 trees** **x** **100** = **82** **% survivability**

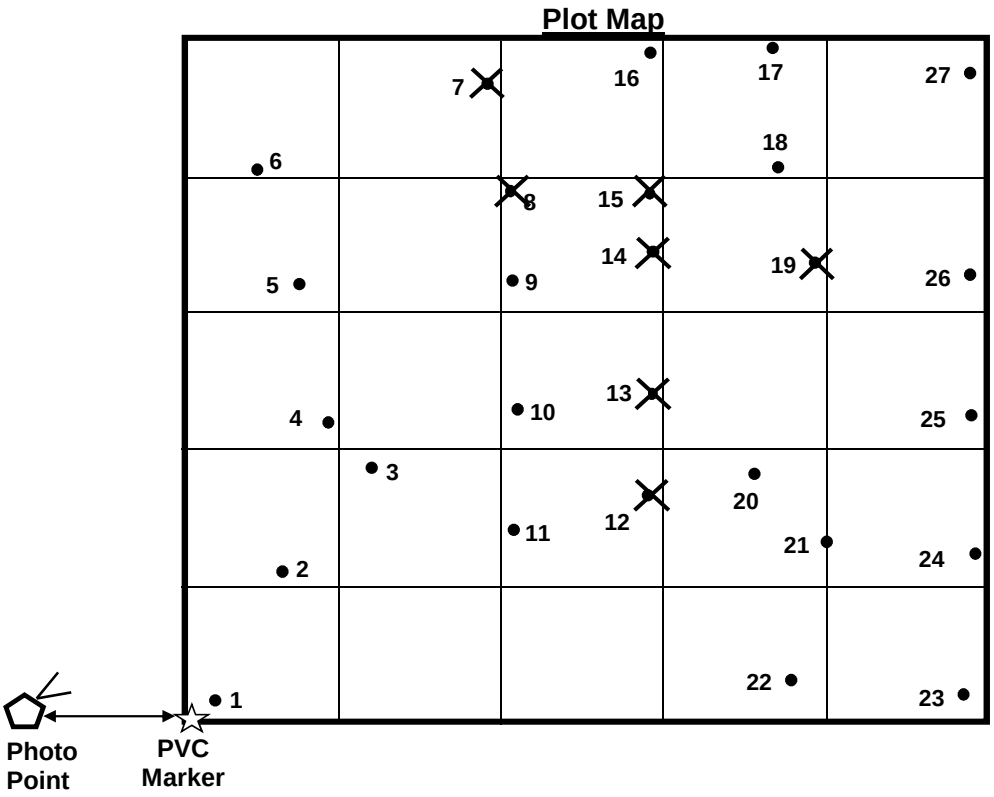
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** W12 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Water Hickory (*Carya aquatica*)	2.40	4	
2	Bald Cypress (*Taxodium distichum*)	1.66	4	
3	Buttonbush (*Cephalanthus occidentalis*)	0.93	4	
4	Bald Cypress (*Taxodium distichum*)	1.22	4	
5	Bald Cypress (*Taxodium distichum*)	1.50	4	
6	Bald Cypress (*Taxodium distichum*)	1.82	4	
7	American Beautyberry (*Callicarpa americana*)			Dead
8	Buttonbush (*Cephalanthus occidentalis*)			Dead
9	Buttonbush (*Cephalanthus occidentalis*)	0.77	3	Deer browse
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.94	4	
11	Buttonbush (*Cephalanthus occidentalis*)			Missing
12	Buttonbush (*Cephalanthus occidentalis*)			Dead
13	Unknown			Dead
14	Buttonbush (*Cephalanthus occidentalis*)			Dead
15	Buttonbush (*Cephalanthus occidentalis*)			Dead
16	Water Hickory (*Carya aquatica*)	1.11	4	
17	Water Hickory (*Carya aquatica*)	1.20	4	
18	Water Hickory (*Carya aquatica*)	1.21	4	
19	Buttonbush (*Cephalanthus occidentalis*)			Dead
20	Water Hickory (*Carya aquatica*)	1.34	4	
21	Bald Cypress (*Taxodium distichum*)	2.05	4	
22	Bald Cypress (*Taxodium distichum*)	2.00	4	
23	Bald Cypress (*Taxodium distichum*)	1.44	4	
24	Buttonbush (*Cephalanthus occidentalis*)	-	1	Stem dead; check for resprout
25	Buttonbush (*Cephalanthus occidentalis*)	1.27	3	Insect damage
26	Bald Cypress (*Taxodium distichum*)	2.19	4	
27	Bald Cypress (*Taxodium distichum*)	1.60	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Water Hickory (*Carya aquatica*)	26.3%
Bald Cypress (*Taxodium distichum*)	47.4%
Buttonbush (*Cephalanthus occidentalis*)	21.1%
Swamp Chestnut Oak (*Quercus michauxii*)	5.3%

Density:

Total Number of Trees **19** / **0.025 acres** = **760** **trees / acre**

Survivability:

Total Number of Trees **19** / **27** **x** **100** = **70** **% survivability**

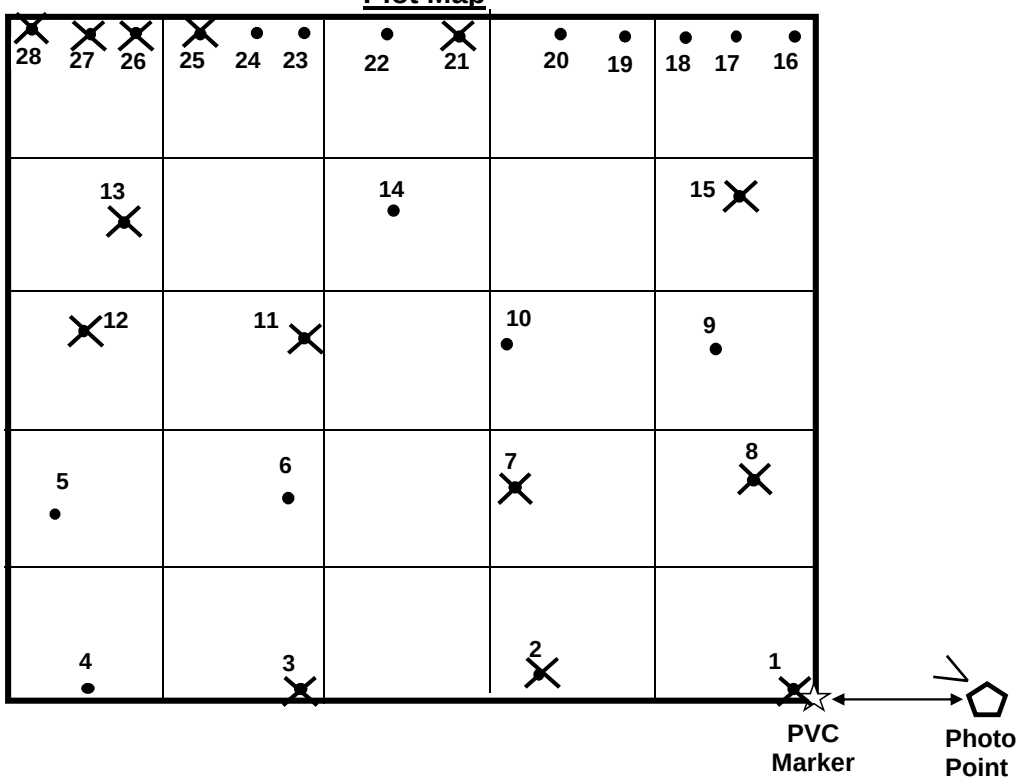
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S1 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	*Quercus sp.*			Dead
2	Unknown			Dead
3	Southern Red Oak (*Quercus falcata)*			Dead
4	Southern Red Oak (*Quercus falcata)*	0.91	4	
5	Southern Red Oak (*Quercus falcata)*	0.55	3	
6	Persimmon (*Diospyros virginiana)*			Missing
7	Unknown			Dead
8	Unknown			Dead
9	Willow Oak (*Quercus phellos*)	1.48	4	
10	Willow Oak (*Quercus phellos)*	1.50	4	Rodent damage
11	Willow Oak (*Quercus phellos)*			Dead
12	Unknown			Dead
13	Southern Red Oak (*Quercus falcata)*			Dead
14	Southern Red Oak (*Quercus falcata)*	0.51	3	
15	Southern Red Oak (*Quercus falcata)*			Dead
16	Silky Dogwood (*Cornus amomum)*	0.39	3	Live Stake, deer browse
17	Silky Dogwood (*Cornus amomum)*			Live Stake, Missing
18	Silky Dogwood (*Cornus amomum)*	0.65	3	Live stake, deer browse
19	Silky Dogwood (*Cornus amomum)*	0.51	3	Live stake, deer browse
20	Silky Dogwood (*Cornus amomum)*			Live stake, Missing
21	Elderberry (*Sambucus canadensis)*			Dead
22	Silky Dogwood (*Cornus amomum)*	0.53	3	Live stake, deer browse
23	Silky Dogwood (*Cornus amomum)*	0.33	3	Live stake, deer browse
24	Silky Dogwood (*Cornus amomum)*	0.28	2	Live stake, deer browse
25	Elderberry (*Sambucus canadensis)*			Live stake, dead
26	Elderberry (*Sambucus canadensis)*			Live stake, dead
27	Elderberry (*Sambucus canadensis)*			Live stake, dead
28	Elderberry (*Sambucus canadensis*)			Live stake, dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	54.5%
Southern Red Oak (*Quercus falcata*)	27.3%
Willow Oak (*Quercus phellos*)	18.2%

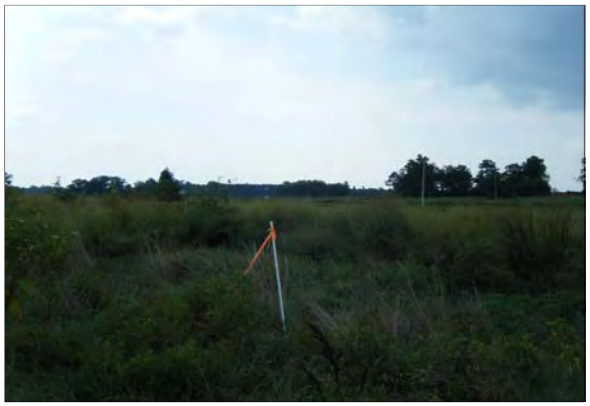
Density:

Total Number of Trees **11** / **0.025 acres** = **440** **trees / acre**

Survivability:

Total Number of Trees **11** / **28 trees** **x 100** = **39** **% survivability**

2nd Year Monitoring

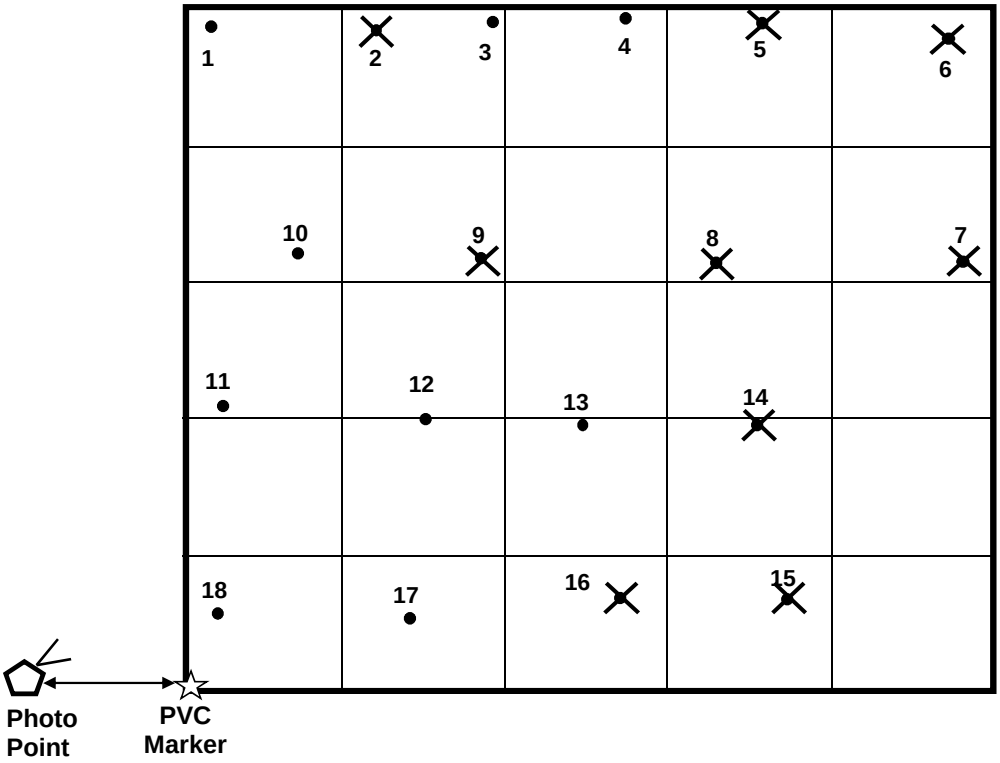


3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S2 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	American Beautyberry (*Callicarpa americana*)	0.40	3	Resprout
2	American Beautyberry (*Callicarpa americana*)			Dead
3	Cherrybark Oak (*Quercus pagoda*)	0.19	1	Resprout
4	Southern Red Oak (*Quercus falcata*)	0.19	3	Resprout
5	American Beautyberry (*Callicarpa americana*)			Dead
6	American Beautyberry (*Callicarpa americana*)			Dead
7	Willow Oak (*Quercus phellos*)			Dead
8	American Beautyberry (*Callicarpa americana*)			Dead
9	*Quercus sp.*			Dead
10	American Beautyberry (*Callicarpa americana*)	1.00	4	
11	Shagbark Hickory (*Carya ovata*)	0.14	2	Resprout
12	Shagbark Hickory (*Carya ovata*)	0.34	2	
13	Shagbark Hickory (*Carya ovata*)	0.07	1	Resprout
14	Southern Red Oak (*Quercus falcata*)			Dead
15	*Quercus sp.*			Dead
16	Willow Oak (*Quercus phellos*)			Dead
17	American Beautyberry (*Callicarpa americana*)	1.34	4	
18	American Beautyberry (*Callicarpa americana*)	1.27	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Southern Red Oak (*Quercus falcata)*	11.1%
Shagbark Hickory (*Carya ovata*)	33.3%
American Beautyberry (*Callicarpa americana*)	44.4%
Cherrybark Oak (*Quercus pagoda*)	11.1%

Density:

Total Number of Trees **9** / **0.025 acres** = **360** **trees / acre**

Survivability:

Total Number of Trees **9** / **18 trees** x **100** = **50** **% survivability**

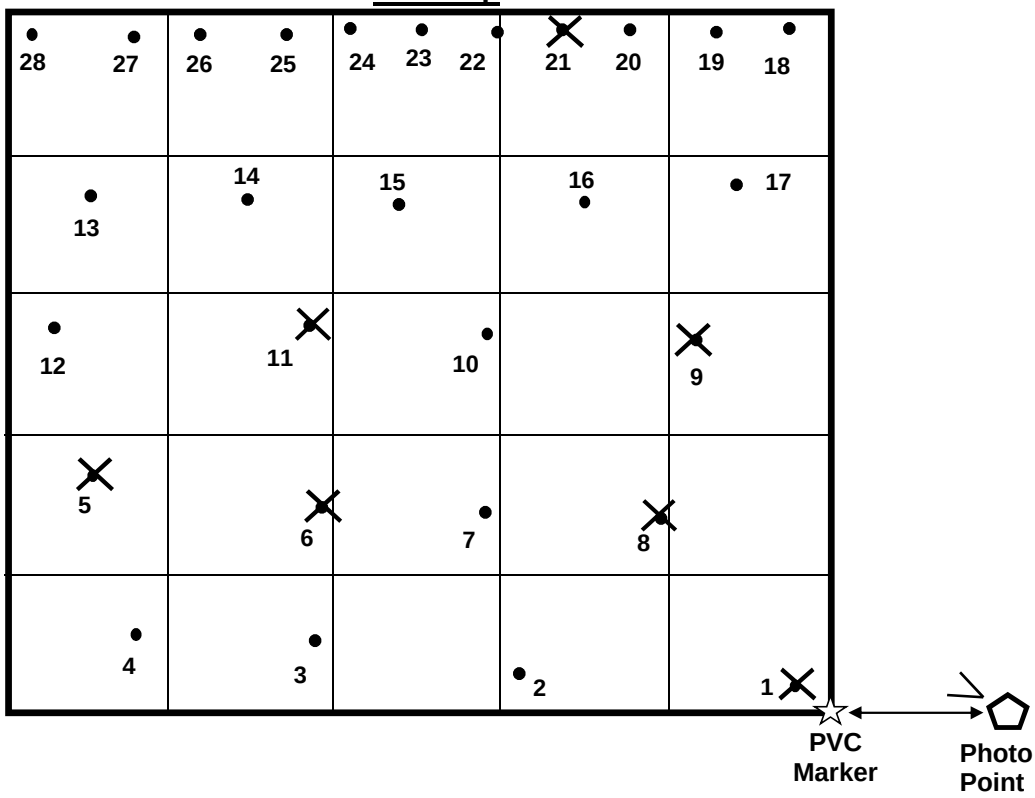
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S3 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Willow Oak (*Quercus phellos*)			Dead
2	American Beautyberry (*Callicarpa americana*)	1.89	4	Insect
3	Persimmon (*Diospyros virginiana*)	1.60	3	Insect, Deer Scraping
4	American Beautyberry (*Callicarpa americana*)	1.03	4	Insect
5	Persimmon (*Diospyros virginiana*)			Dead
6	Shagbark Hickory (*Carya ovata*)			Dead
7	Shagbark Hickory (*Carya ovata*)	0.28	3	Insect
8	Shagbark Hickory (*Carya ovata*)			Dead
9	Unknown			Dead
10	Willow Oak (*Quercus phellos*)	1.75	4	
11	Unknown			Dead
12	Persimmon (*Diospyros virginiana*)	2.27	4	
13	Persimmon (*Diospyros virginiana*)	1.58	4	
14	Persimmon (*Diospyros virginiana*)	0.29	2	Resprout
15	Persimmon (*Diospyros virginiana*)	1.62	4	
16	Persimmon (*Diospyros virginiana*)	1.71	4	
17	Cherrybark Oak (*Quercus pagoda*)	1.10	4	
18	Elderberry (*Sambucus canadensis*)	1.85	3	Live stake
19	Elderberry (*Sambucus canadensis*)	1.22	4	Live stake
20	Silky Dogwood (*Cornus amomum*)	1.67	3	Live stake, deer browse
21	Elderberry (*Sambucus canadensis*)			Live stake, dead
22	Elderberry (*Sambucus canadensis*)	1.47	3	Live stake
23	Silky Dogwood (*Cornus amomum*)	1.16	3	Live stake, deer browse
24	Elderberry (*Sambucus canadensis*)	1.43	3	Live stake
25	Elderberry (*Sambucus canadensis*)	2.16	4	Live stake
26	Silky Dogwood (*Cornus amomum*)	1.69	3	Live stake, leaf wilt
27	Silky Dogwood (*Cornus amomum*)	0.88	3	Live stake, deer browse, insect
28	Silky Dogwood (*Cornus amomum*)	0.77	3	Live stake, deer browse, insect

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Elderberry (*Sambucus canadensis*)	23.8%
Silky Dogwood (*Cornus amomum*)	23.8%
American Beautyberry (*Callicarpa americana*)	9.5%
Willow Oak (*Quercus phellos*)	4.8%
Persimmon (*Diospyros virginiana*)	28.6%
Cherrybark Oak (*Quercus pagoda*)	4.8%
Shagbark Hickory (*Carya ovata*)	4.8%

Density:

Total Number of Trees **21** / **0.025 acres** = **840** **trees / acre**

Survivability:

Total Number of Trees **21** / **28 trees** **x 100** = **75** **% survivability**

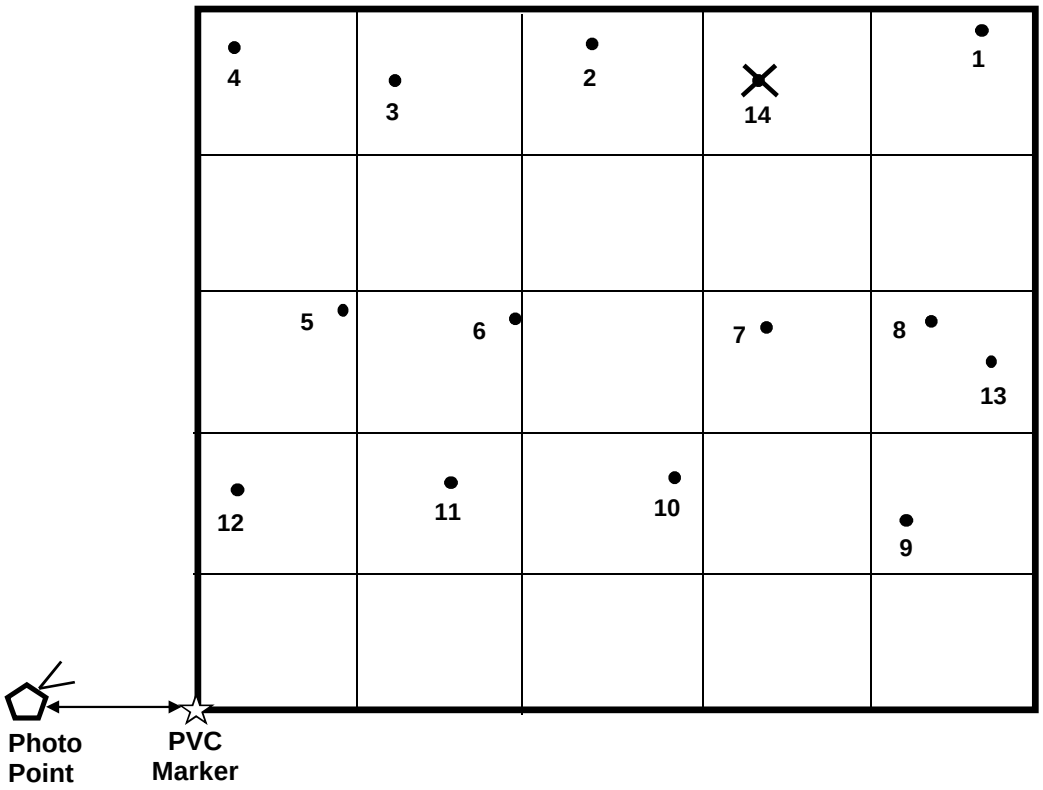
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S4 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	American Beautyberry (*Callicarpa americana*)	0.36	3	Insect
2	Willow Oak (*Quercus phellos*)	0.65	4	
3	Willow Oak (*Quercus phellos)*	0.56	4	
4	Willow Oak (*Quercus phellos)*	1.45	4	
5	Swamp Chestnut Oak (*Quercus michauxii*)	2.50	4	
6	Sugarberry (*Celtis laevigata*)	1.31	3	Insect
7	Swamp Chestnut Oak (*Quercus michauxii*)	0.91	3	Insect
8	River Birch (*Betula nigra*)	-	1	Stem dead; check for resprout
9	Swamp Chestnut Oak (*Quercus michauxii*)	1.63	4	
10	Sugarberry (*Celtis laevigata*)	0.26	2	Resprout
11	Sugarberry (*Celtis laevigata*)	0.23	1	Deer, Main stem died back
12	American Beautyberry (*Callicarpa americana*)	0.58	3	
13	Sugarberry (*Celtis laevigata*)	0.75	3	Not counted during baseline monitoring, Insect
14	Sugarberry (*Celtis laevigata*)			Not counted during baseline monitoring, Dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
River Birch (*Betula nigra*)	7.7%
American Beautyberry (*Callicarpa americana*)	15.4%
Willow Oak (*Quercus phellos*)	23.1%
Swamp Chestnut Oak (*Quercus michauxii*)	23.1%
Sugarberry (*Celtis laevigata*)	30.8%

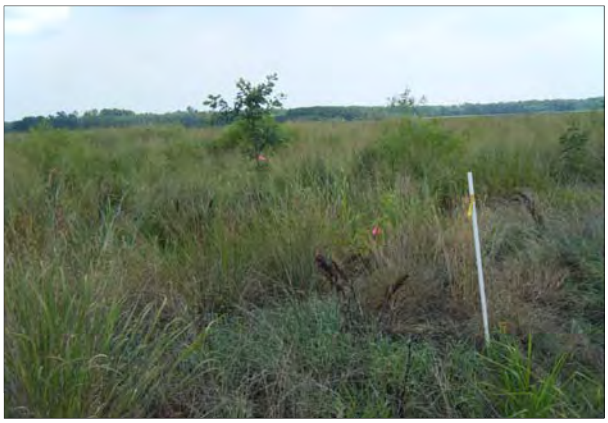
Density:

Total Number of Trees **13** / **0.025 acres** = **520** **trees / acre**

Survivability:

Total Number of Trees **13** / **14 trees** **x** **100** = **93** **% survivability***

2nd Year Monitoring

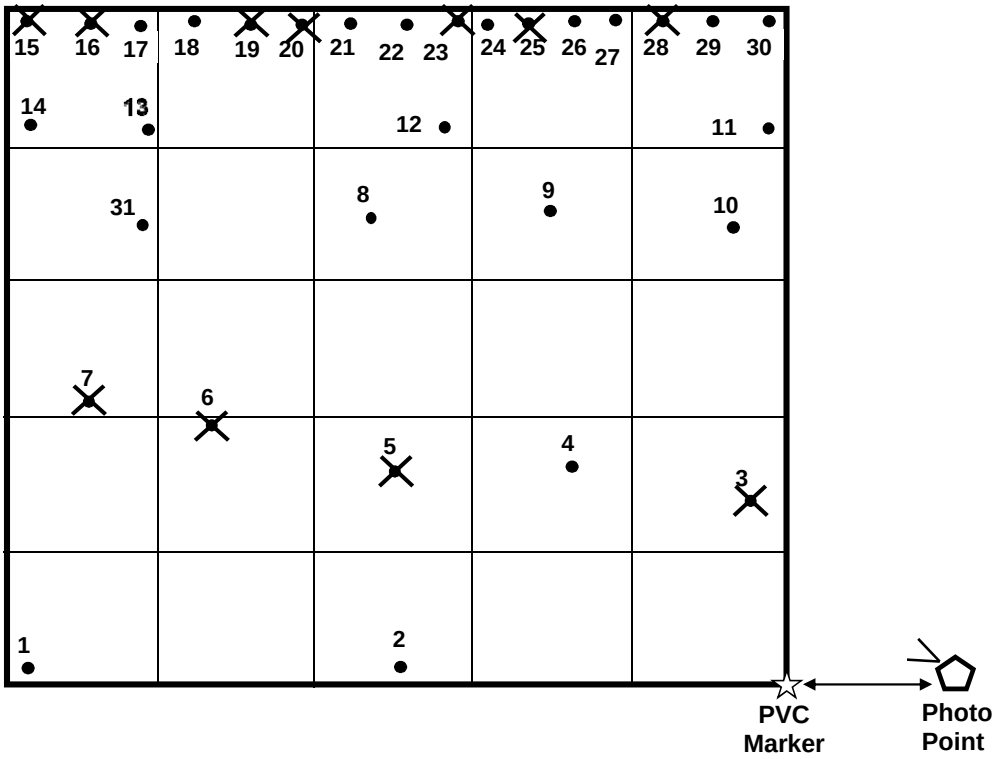


3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S5 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	River Birch (*Betula nigra*)	0.75	3	
2	River Birch (*Betula nigra*)	1.26	3	
3	*Quercus sp.*			Dead
4	Willow Oak (*Quercus phellos*)	0.49	3	
5	*Quercus sp.*			Dead
6	Sugarberry (*Celtis laevigata*)			Dead
7	*Quercus sp.*			Dead
8	Swamp Chestnut Oak (*Quercus michauxii*)	0.89	4	Top died back
9	Swamp Chestnut Oak (*Quercus michauxii*)	0.71	3	Top died back, insect
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.34	2	
11	Willow Oak (*Quercus phellos*)	0.85	3	
12	River Birch (*Betula nigra*)	1.64	3	
13	River Birch (*Betula nigra*)	1.50	3	
14	Sugarberry (*Celtis laevigata*)	0.85	4	
15	Elderberry (*Sambucus canadensis*)			Live stake, dead
16	Elderberry (*Sambucus canadensis*)			Live stake, dead
17	Silky Dogwood (*Cornus amomum*)	0.22	2	Live stake, Deer browse
18	Silky Dogwood (*Cornus amomum*)	0.38	3	Live stake, Deer browse
19	Black Willow (*Salix nigra*)			Live stake, dead
20	Elderberry (*Sambucus canadensis*)			Live stake, dead
21	Silky Dogwood (*Cornus amomum*)	0.60	3	Live stake, Deer browse
22	Silky Dogwood (*Cornus amomum*)	0.17	2	Live stake
23	Elderberry (*Sambucus canadensis*)			Live stake, dead
24	Silky Dogwood (*Cornus amomum*)	0.27	2	Live stake
25	Elderberry (*Sambucus canadensis*)			Live stake, dead
26	Silky Dogwood (*Cornus amomum*)	0.60	3	Live stake
27	Silky Dogwood (*Cornus amomum*)	0.56	3	Live stake, Deer browse
28	Elderberry (*Sambucus canadensis*)			Live stake, dead
29	Silky Dogwood (*Cornus amomum*)	0.62	3	Live stake
30	Elderberry (*Sambucus canadensis*)	0.48	3	Live stake, Deer browse
31	Swamp Chestnut Oak (*Quercus michauxii*)	0.28	2	Resprout, insect

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	40.0%
Elderberry (*Sambucus canadensis*)	5.0%
River Birch (*Betula nigra*)	20.0%
Willow Oak (*Quercus phellos*)	10.0%
Sugarberry (*Celtis laevigata*)	5.0%
Swamp Chestnut Oak (*Quercus michauxii*)	20.0%

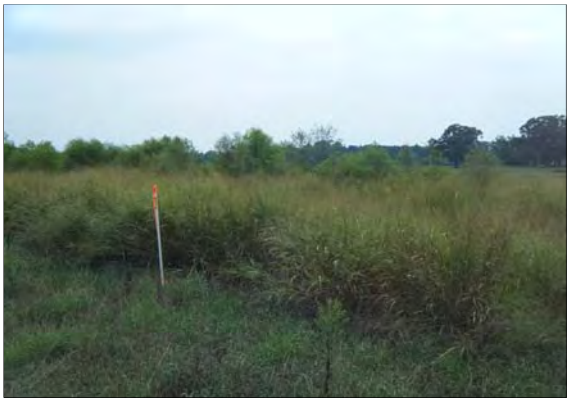
Density:

Total Number of Trees **20** / **0.025 acres** = **800** **trees / acre**

Survivability:

Total Number of Trees **20** / **31 trees** **x** **100** = **65** **% survivability**

2nd Year Monitoring

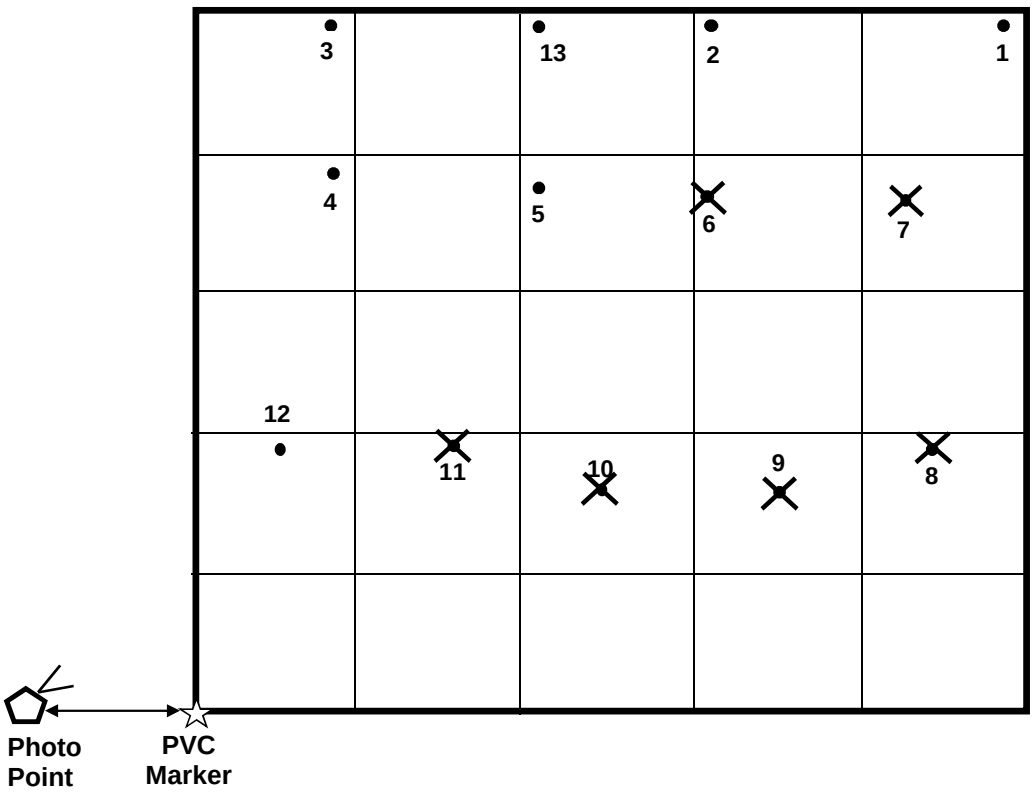


3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S6 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Swamp Chestnut Oak (*Quercus michauxii*)	0.68	4	Deer browse, main top died back
2	Swamp Chestnut Oak (*Quercus michauxii*)	0.78	3	Insect damage
3	Swamp Chestnut Oak (*Quercus michauxii*)	1.06	4	
4	American Beautyberry (*Callicarpa americana*)	0.62	3	
5	American Beautyberry (*Callicarpa americana*)	0.60	3	
6	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
7	River Birch (*Betula nigra*)			Dead
8	Sugarberry (*Celtis laevigata*)			Dead
9	Sugarberry (*Celtis laevigata*)			Dead
10	*Quercus sp.*			Dead
11	*Quercus sp.*			Dead
12	River Birch (*Betula nigra*)	2.95	4	
13	Swamp Chestnut Oak (Quercus michauxii)	1.01	3	Insect damage

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
River Birch (*Betula nigra*)	14.3%
American Beautyberry (*Callicarpa americana*)	28.6%
Swamp Chestnut Oak (*Quercus michauxii*)	57.1%

Density:

Total Number of Trees **7** / **0.025 acres** = **280** **trees / acre**

Survivability:

Total Number of Trees **7** / **12 trees** **x 100** = **58** **% survivability**

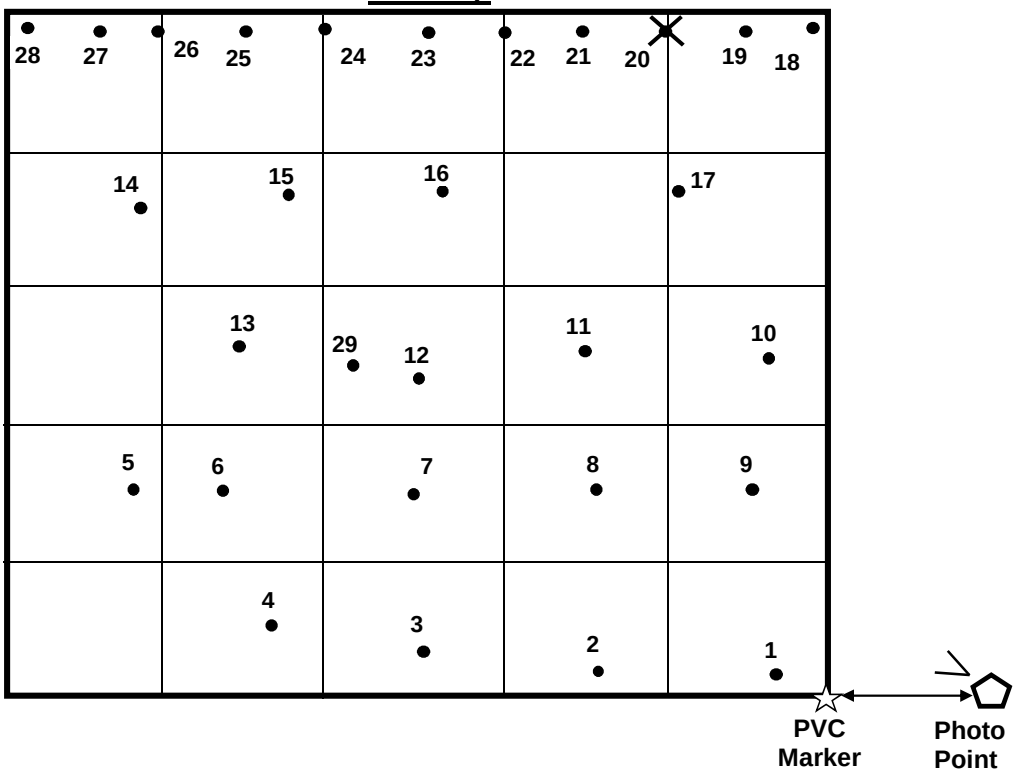
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S7 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Swamp Chestnut Oak (*Quercus michauxii*)	0.08	2	Resprout
2	Sugarberry (*Celtis laevigata*)	0.79	4	Deer browse
3	Sugarberry (*Celtis laevigata*)	0.79	4	
4	Sugarberry (*Celtis laevigata*)	0.90	4	Wasp nest
5	Southern Red Oak (*Quercus falcata*)	0.81	4	
6	Swamp Chestnut Oak (*Quercus michauxii*)	1.25	4	
7	American Beautyberry (*Callicarpa americana*)	0.85	3	
8	American Beautyberry (*Callicarpa americana*)	0.85	3	
9	American Beautyberry (*Callicarpa americana*)	1.24	3	Insect damage
10	Willow Oak (*Quercus phellos*)	1.05	4	
11	Willow Oak (*Quercus phellos*)	0.69	3	
12	Willow Oak (*Quercus phellos*)	0.38	3	
13	Willow Oak (*Quercus phellos*)	0.63	3	
14	American Beautyberry (*Callicarpa americana*)	1.47	4	
15	American Beautyberry (*Callicarpa americana*)	1.18	4	
16	American Beautyberry (*Callicarpa americana*)	1.21	3	
17	American Beautyberry (*Callicarpa americana*)	1.08	3	
18	Silky Dogwood (*Cornus amomum*)	0.78	3	Live stake, deer browse
19	Silky Dogwood (*Cornus amomum*)	1.01	4	Live stake
20	Silky Dogwood (*Cornus amomum*)			Dead
21	Silky Dogwood (*Cornus amomum*)	0.75	3	Live stake, deer browse
22	Silky Dogwood (*Cornus amomum*)	0.71	4	Live stake, deer browse
23	Silky Dogwood (*Cornus amomum*)	0.80	3	Live stake, deer browse
24	Silky Dogwood (*Cornus amomum*)	0.74	3	Live stake, deer browse
25	Silky Dogwood (*Cornus amomum*)	0.75	3	Live stake, deer browse
26	Elderberry (*Sambucus canadensis*)	1.31	2	Live stake, insect damage
27	Elderberry (*Sambucus canadensis*)	1.10	2	Live stake, insect damage
28	Elderberry (*Sambucus canadensis*)			Live stake, Missing
29	Swamp Chestnut Oak (*Quercus michauxii*)	0.21	3	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	25.9%
Elderberry (*Sambucus canadensis*)	7.4%
American Beautyberry (*Callicarpa americana*)	25.9%
Sugarberry (*Celtis laevigata*)	11.1%
Swamp Chestnut Oak (*Quercus michauxii*)	11.1%
Southern Red Oak (*Quercus falcata*)	3.7%
Willow Oak (*Quercus phellos*)	14.8%

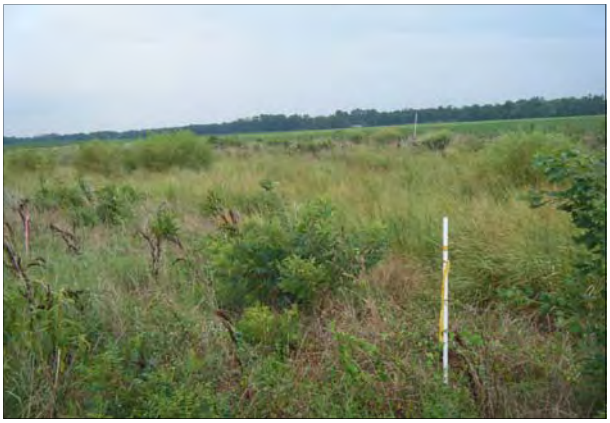
Density:

Total Number of Trees **27** / **0.025 acres** = **1080** **trees / acre**

Survivability:

Total Number of Trees **27** / **29 trees** x **100** = **93** **% survivability**

2nd Year Monitoring

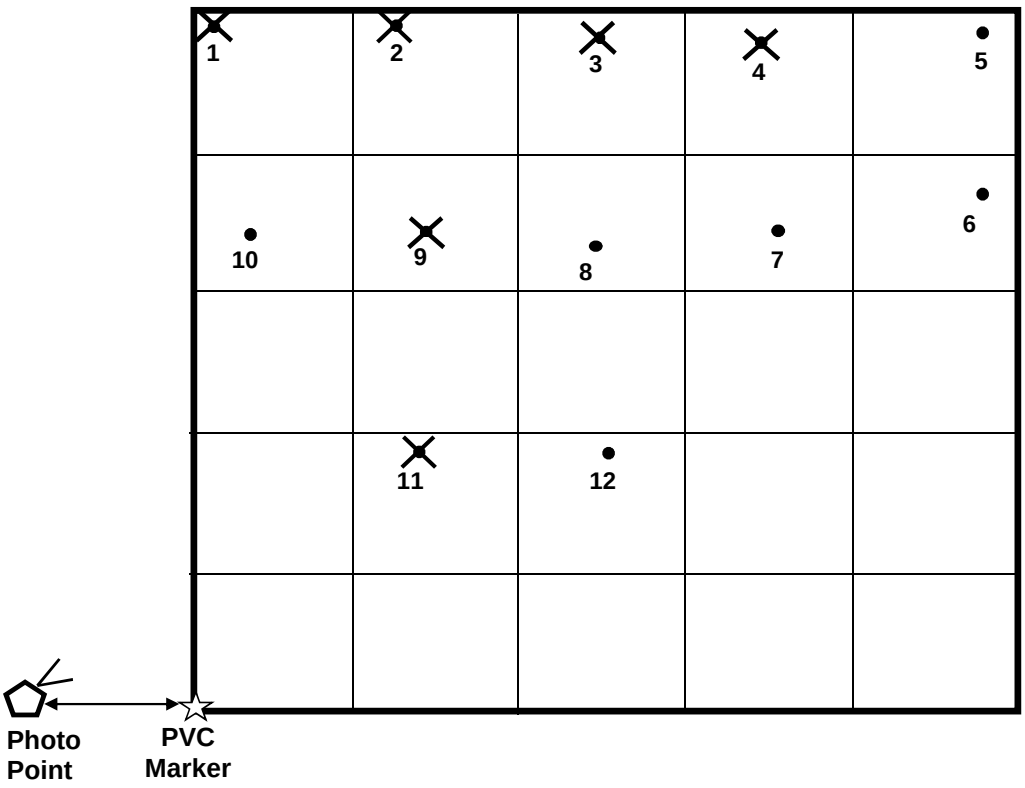


3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S8 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Unknown			Dead
2	Unknown			Dead
3	Unknown			Dead
4	Sugarberry (*Celtis laevigata*)			Dead
5	Willow Oak (*Quercus phellos*)	0.45	2	Deer browse
6	American Beautyberry (*Callicarpa americana*)	0.25	2	Resprout
7	American Beautyberry (*Callicarpa americana*)	0.12	2	Resprout
8	American Beautyberry (*Callicarpa americana*)	0.25	3	
9	American Beautyberry (*Callicarpa americana*)			Dead
10	American Beautyberry (*Callicarpa americana*)	0.39	3	
11	Unknown			Missing
12	American Beautyberry (*Callicarpa americana*)	0.51	3	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
American Beautyberry (*Callicarpa americana*)	83.3%
Willow Oak (*Quercus phellos*)	16.7%

Density:

Total Number of Trees **6** / **0.025 acres** = **240** **trees / acre**

Survivability:

Total Number of Trees **6** / **12 trees** **x 100** = **50** **% survivability**

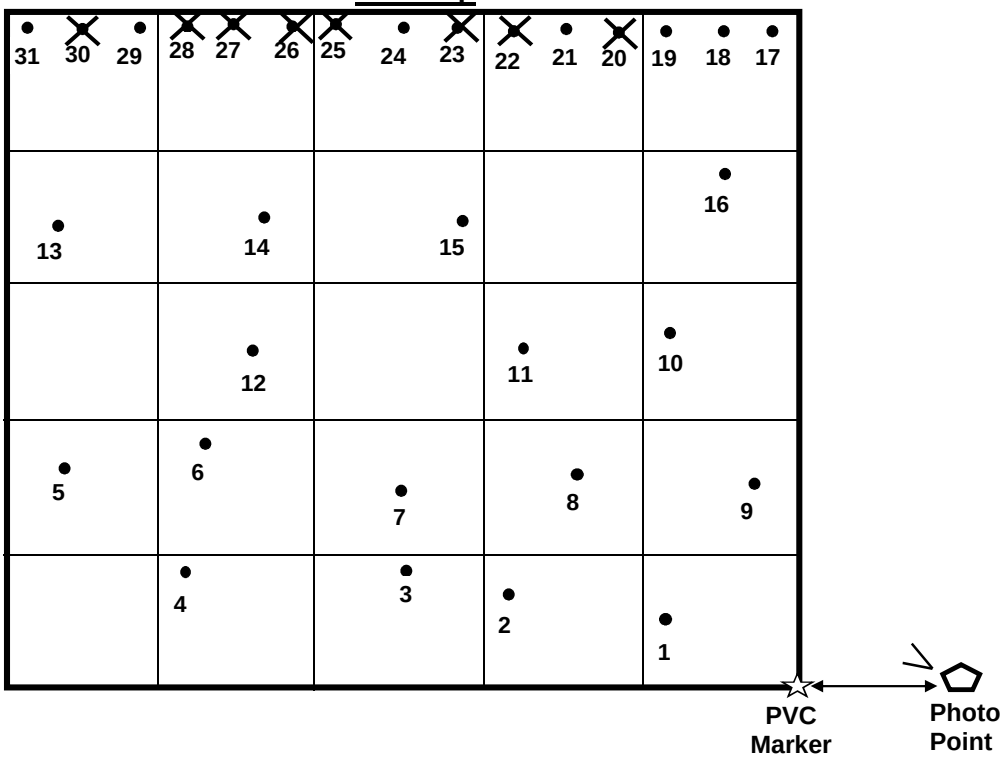
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S9 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Sugarberry (*Celtis laevigata*)	0.30	1	
2	Persimmon (*Diospyros virginiana*)	0.35	2	Main stem broke off
3	Persimmon (*Diospyros virginiana*)	0.45	2	Main stem broke off
4	Persimmon (*Diospyros virginiana*)	0.85	4	
5	Willow Oak (*Quercus phellos*)	0.50	3	
6	Willow Oak (*Quercus phellos*)			Missing
7	Swamp Chestnut Oak (*Quercus michauxii*)	0.15	2	Resprout
8	River Birch (*Betula nigra*)	0.90	3	Fungus
9	River Birch (*Betula nigra*)	1.71	4	Deer browse
10	Persimmon (*Diospyros virginiana*)	0.50	2	
11	Willow Oak (*Quercus phellos*)	0.14	2	Resprout
12	Persimmon (*Diospyros virginiana*)	0.58	2	
13	Swamp Chestnut Oak (*Quercus michauxii*)	0.19	2	Resprout
14	Willow Oak (*Quercus phellos*)	0.43	2	
15	River Birch (*Betula nigra*)	0.64	3	
16	River Birch (*Betula nigra*)	1.48	4	
17	Silky Dogwood (*Cornus amomum*)	0.96	4	Deer browse
18	Silky Dogwood (*Cornus amomum*)	0.55	3	Deer browse
19	Silky Dogwood (*Cornus amomum*)	0.19	2	Deer browse
20	Elderberry (*Sambucus canadensis*)			Dead, live stake
21	Black Willow (*Salix nigra*)	0.70	3	Live stake, fungus
22	Silky Dogwood (*Cornus amomum*)			Dead, live stake
23	Silky Dogwood (*Cornus amomum*)			Dead, live stake
24	Silky Dogwood (*Cornus amomum*)	0.18	2	Live stake, resprout
25	Silky Dogwood (*Cornus amomum*)			Dead, live stake
26	Silky Dogwood (*Cornus amomum*)			Dead, live stake
27	Silky Dogwood (*Cornus amomum*)			Dead, live stake
28	Black Willow (*Salix nigra*)			Dead, live stake
29	Black Willow (*Salix nigra*)	2.40	4	Live stake
30	Black Willow (*Salix nigra*)			Dead, live stake
31	Black Willow (*Salix nigra*)	0.78	3	Live stake

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	18.2%
Black Willow (*Salix nigra*)	9.1%
River Birch (*Betula nigra*)	18.2%
Willow Oak (*Quercus phellos*)	13.6%
Swamp Chestnut Oak (*Quercus michauxii*)	9.1%
Persimmon (*Diospyros virginiana*)	22.7%
Sugarberry (*Celtis laevigata*)	4.5%

Density:

Total Number of Trees **22** / **0.025 acres** = **880** **trees / acre**

Survivability:

Total Number of Trees **22** / **31 trees** **x** **100** = **71** **% survivability**

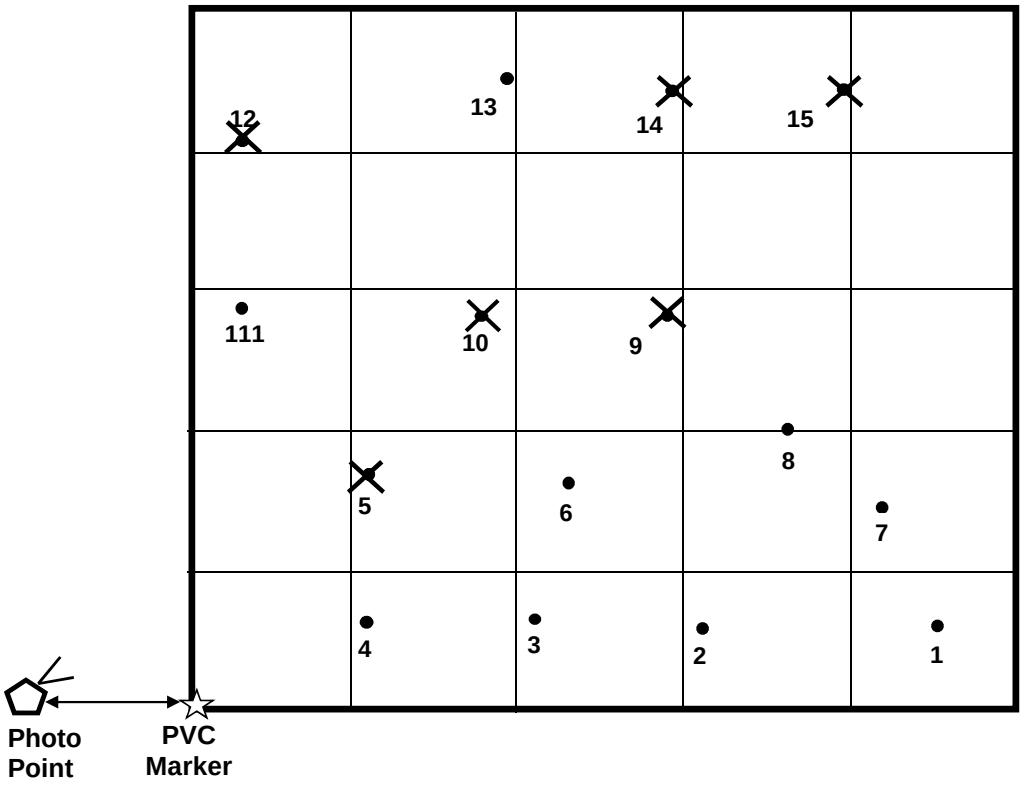
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S10 **Date:** 7/23/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Sycamore (*Platanus occidentalis*)	1.74	4	
2	Sycamore (*Platanus occidentalis*)	0.92	3	
3	Sycamore (*Platanus occidentalis*)	0.34	2	Top died back
4	Sycamore (*Platanus occidentalis*)	0.75	2	Insect damage
5	*Quercus sp.*			Dead
6	Willow Oak (*Quercus phellos*)	0.35	3	
7	Willow Oak (*Quercus phellos*)	0.19	2	Top died back
8	Sugarberry (*Celtis laevigata*)	0.44	2	Top died back
9	Sugarberry (*Celtis laevigata*)			Dead
10	Unknown			Dead
11	Persimmon (*Diospyros virginiana*)	1.70	4	
12	American Beautyberry (*Callicarpa americana*)			Dead
13	American Beautyberry (*Callicarpa americana*)	0.13	2	Resprout
14	American Beautyberry (*Callicarpa americana*)			Dead
15	American Beautyberry (*Callicarpa americana*)			Dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Sycamore (*Platanus occidentalis*)	44.4%
Willow Oak (*Quercus phellos*)	22.2%
Sugarberry (*Celtis laevigata*)	11.1%
Persimmon (*Diospyros virginiana*)	11.1%
American Beautyberry (*Callicarpa americana*)	11.1%

Density:

Total Number of Trees **9** / **0.025 acres** = **360** **trees / acre**

Survivability:

Total Number of Trees **9** / **15 trees** **x 100** = **60** **% survivability**

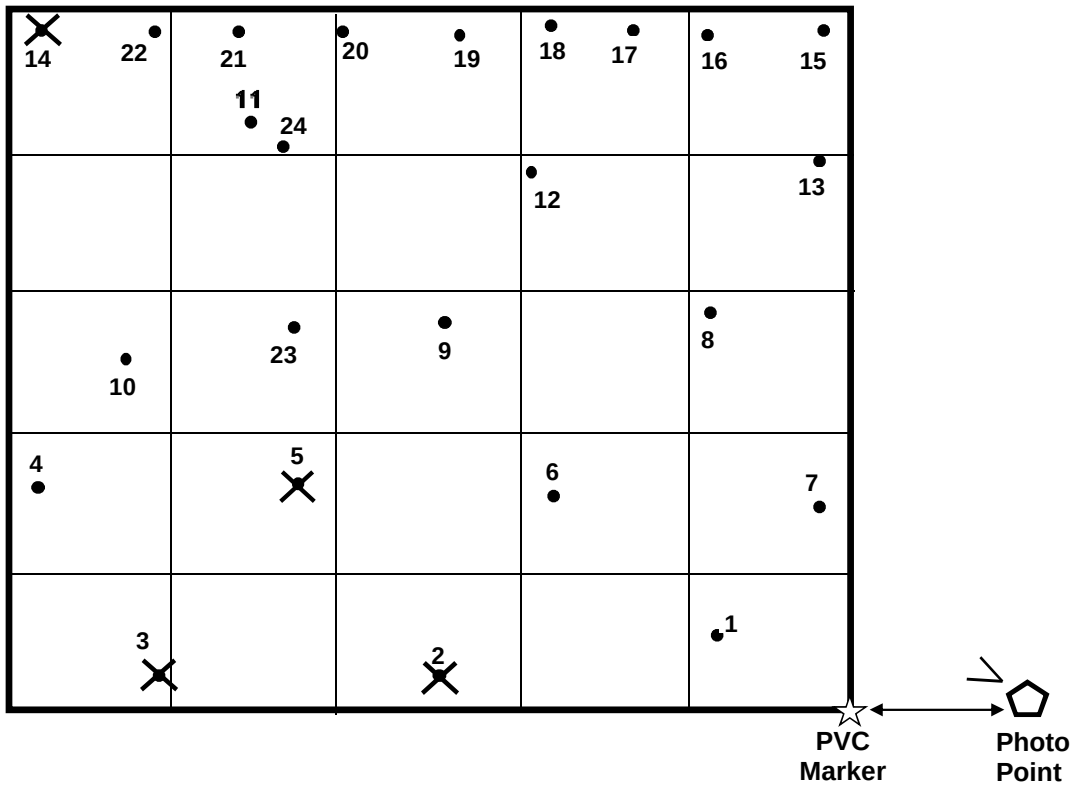
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S11 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	American Beautyberry (*Callicarpa americana*)	-	1	Stem dead, check for resprout
2	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
3	American Beautyberry (*Callicarpa americana*)			Dead
4	Willow Oak (*Quercus phellos*)	0.68	4	
5	American Beautyberry (*Callicarpa americana*)			Dead
6	Southern Red Oak (*Quercus falcata*)	0.29	3	
7	American Beautyberry (*Callicarpa americana*)	0.11	2	Resprout
8	Swamp Chestnut Oak (*Quercus michauxii*)	0.38	3	
9	American Beautyberry (*Callicarpa americana*)	0.23	2	
10	Persimmon (*Diospyros virginiana*)	1.15	4	
11	Persimmon (*Diospyros virginiana*)	0.85	4	
12	American Beautyberry (*Callicarpa americana*)	0.46	3	
13	Swamp Chestnut Oak (*Quercus michauxii*)	0.36	3	Deer browse
14	Elderberry (*Sambucus canadensis*)			Live stake, dead
15	Silky Dogwood (*Cornus amomum*)	0.50	3	Live stake, deer browse
16	Silky Dogwood (*Cornus amomum*)	0.51	3	Live stake, deer browse
17	Silky Dogwood (*Cornus amomum*)	0.54	3	Live stake, deer browse
18	Silky Dogwood (*Cornus amomum*)	0.61	4	Live stake, deer browse
19	Silky Dogwood (*Cornus amomum*)	0.68	4	Live stake, deer browse
20	Silky Dogwood (*Cornus amomum*)	0.58	3	Live stake, deer browse
21	Elderberry (*Sambucus canadensis*)	0.42	3	Live stake
22	Black Willow (*Salix nigra*)	1.50	4	Live stake
23	Sugarberry (*Celtis laevigata*)	0.37	2	
24	Sugarberry (*Celtis laevigata*)	0.23	2	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	30.0%
Elderberry (*Sambucus canadensis*)	5.0%
Black Willow (*Salix nigra*)	5.0%
American Beautyberry (*Callicarpa americana*)	20.0%
Swamp Chestnut Oak (*Quercus michauxii*)	10.0%
Willow Oak (*Quercus phellos*)	5.0%
Persimmon (*Diospyros virginiana*)	10.0%
Sugarberry (*Celtis laevigata*)	10.0%
Southern Red Oak (*Quercus falcata*)	5.0%

Density:

Total Number of Trees **20** / **0.025 acres** = **800** **trees / acre**

Survivability:

Total Number of Trees **20** / **23 trees** **x** **100** = **87** **% survivability**

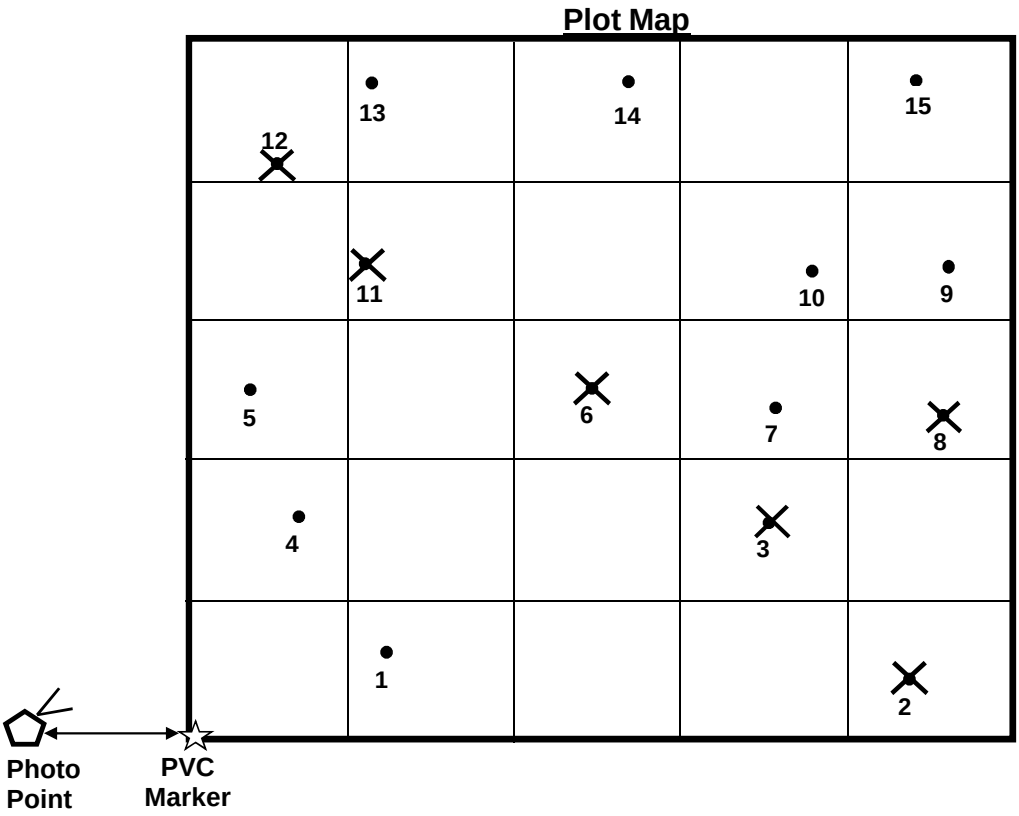
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S12 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Sycamore (*Platanus occidentalis*)	0.15	1	Main stem died back
2	American Beautyberry (*Callicarpa americana*)			Dead
3	*Quercus sp.*			Dead
4	Sycamore (*Platanus occidentalis*)	1.14	3	
5	River Birch (*Betula nigra*)	1.64	3	
6	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
7	River Birch (*Betula nigra*)	0.91	3	
8	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
9	River Birch (*Betula nigra*)	0.86	3	
10	Sugarberry (*Celtis laevigata*)	0.45	3	
11	Sycamore (*Platanus occidentalis*)			Dead
12	Unknown			Dead
13	River Birch (*Betula nigra*)	2.14	4	
14	American Beautyberry (*Callicarpa americana*)	0.44	3	
15	River Birch (*Betula nigra*)	1.05	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
River Birch (*Betula nigra*)	55.6%
Sycamore (*Platanus occidentalis*)	22.2%
American Beautyberry (*Callicarpa americana*)	11.1%
Sugarberry (*Celtis laevigata*)	11.1%

Density:

Total Number of Trees **9** / **0.025 acres** = **360** **trees / acre**

Survivability:

Total Number of Trees **9** / **15** x **100** = **60** **% survivability**

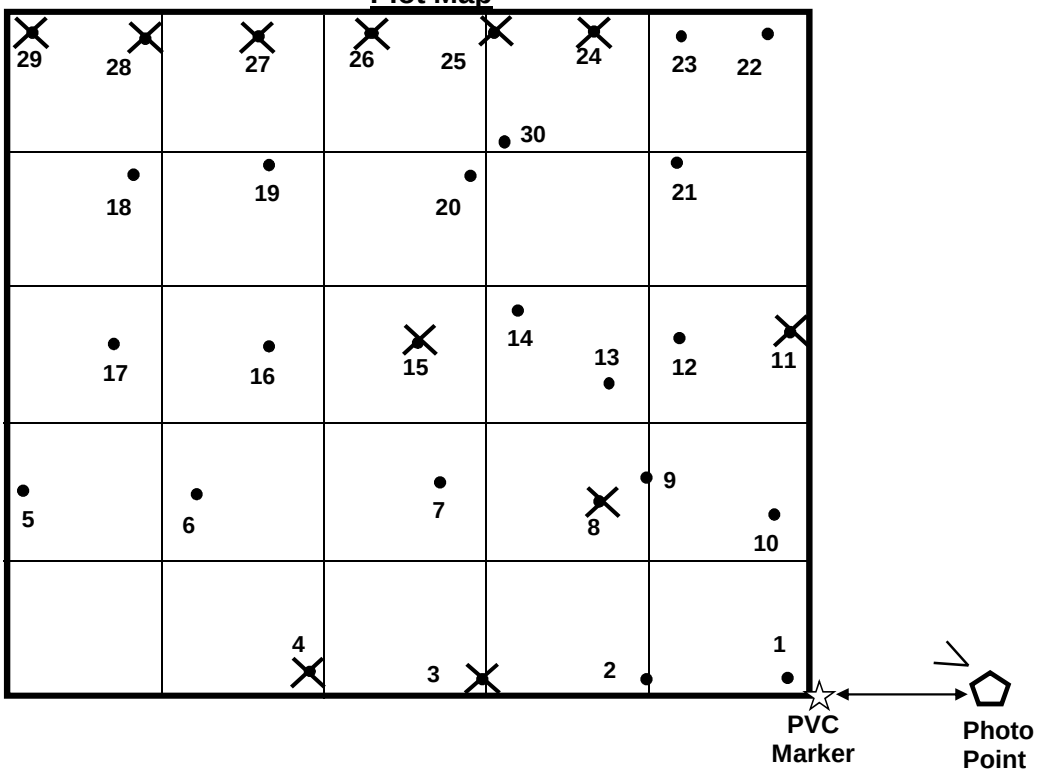
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S13 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Sugarberry (*Celtis laevigata*)	0.06	1	Resprout
2	Sugarberry (*Celtis laevigata*)	0.88	4	
3	Unknown			Dead
4	American Beautyberry (*Callicarpa americana*)			Dead
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.00	4	
6	Sycamore (*Platanus occidentalis*)	1.86	4	
7	Swamp Chestnut Oak (*Quercus michauxii*)	0.56	4	
8	Possumhaw (*Viburnum nudum*)			Dead
9	Swamp Chestnut Oak (*Quercus michauxii*)	0.36	3	Main stem died back
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.58	3	
11	Sugarberry (*Celtis laevigata*)			Dead
12	Possumhaw (*Viburnum nudum*)			Dead
13	Sugarberry (*Celtis laevigata*)	0.31	2	
14	Sugarberry (*Celtis laevigata*)	0.28	2	
15	Possumhaw (*Viburnum nudum*)			Dead
16	Sugarberry (*Celtis laevigata*)	0.26	2	
17	Sugarberry (*Celtis laevigata*)	0.33	2	
18	American Beautyberry (*Callicarpa americana*)	0.45	4	
19	American Beautyberry (*Callicarpa americana*)	0.28	2	
20	American Beautyberry (*Callicarpa americana*)	0.42	3	
21	American Beautyberry (*Callicarpa americana*)	0.38	3	
22	Silky Dogwood (*Cornus amomum*)	0.36	3	Live stake, deer browse
23	Silky Dogwood (*Cornus amomum*)	0.17	2	Live stake
24	Silky Dogwood (*Cornus amomum*)			Live stake, dead
25	Elderberry (*Sambucus canadensis*)			Live stake, dead
26	Silky Dogwood (*Cornus amomum*)			Live stake, dead
27	Elderberry (*Sambucus canadensis*)			Live stake, dead
28	Silky Dogwood (*Cornus amomum*)			Live stake, dead
29	Silky Dogwood (*Cornus amomum*)			Live stake, dead
30	Green Ash (*Fraxinus pennsylvanica*)	0.52	3	Not counted during baseline monitoring

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	11.1%
Sycamore (*Platanus occidentalis*)	5.6%
American Beautyberry (*Callicarpa americana*)	22.2%
Sugarberry (*Celtis laevigata*)	33.3%
Swamp Chestnut Oak (*Quercus michauxii*)	22.2%
Green Ash (Fraxinus pennsylvanica)	5.6%

Density:

Total Number of Trees **18** / **0.025 acres** = **720** **trees / acre**

Survivability:

Total Number of Trees **18** / **30** x **100** = **60** **% survivability**

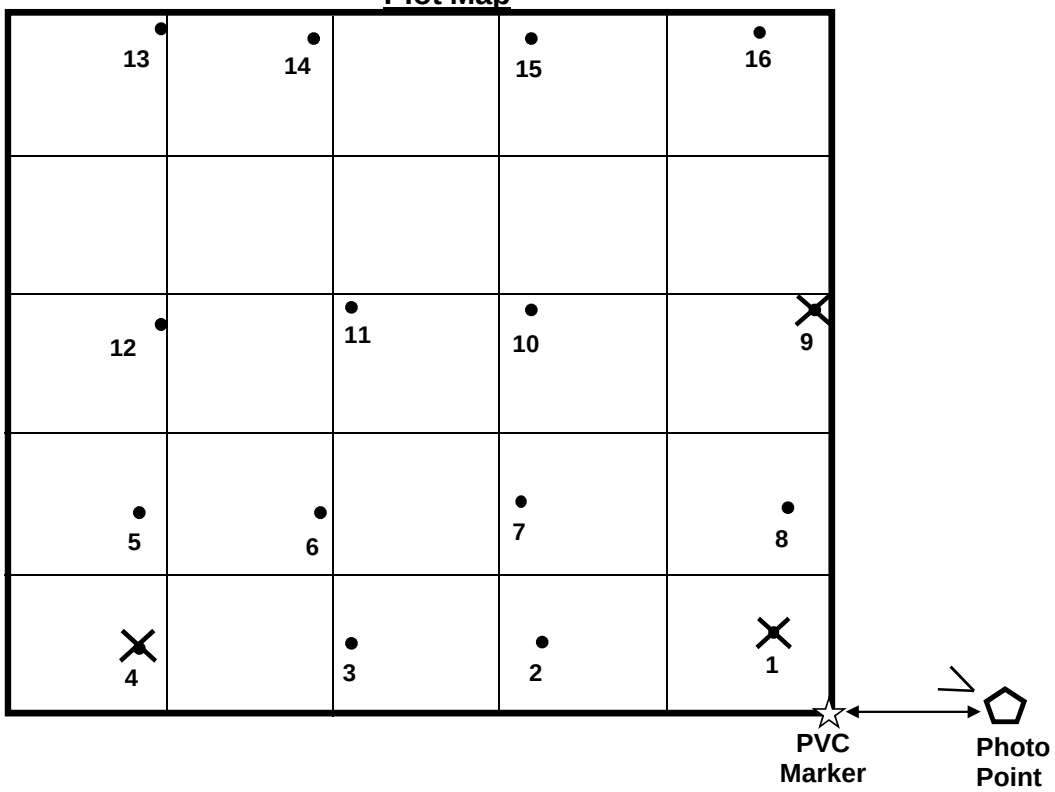
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S14 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	American Beautyberry (*Callicarpa americana*)			Dead
2	Swamp Chestnut Oak (*Quercus michauxii*)	0.92	4	
3	Swamp Chestnut Oak (*Quercus michauxii*)	0.81	4	
4	*Quercus sp.*			Dead
5	Persimmon (*Diospyros virginiana*)	0.98	4	
6	River Birch (*Betula nigra*)	1.27	4	
7	American Beautyberry (*Callicarpa americana*)	0.62	3	
8	Persimmon (*Diospyros virginiana*)	1.73	4	Insect damage
9	Willow Oak (*Quercus phellos*)			Dead
10	Persimmon (*Diospyros virginiana*)	0.87	3	
11	Persimmon (*Diospyros virginiana*)	0.75	3	Insect damage
12	Persimmon (*Diospyros virginiana*)	0.72	3	
13	River Birch (*Betula nigra*)	0.66	2	
14	Persimmon (*Diospyros virginiana*)	0.27	2	Insect damage
15	Persimmon (*Diospyros virginiana*)	0.22	2	Resprout, Insect damage
16	American Beautyberry (*Callicarpa americana*)	0.60	3	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
River Birch (*Betula nigra*)	15.4%
Swamp Chestnut Oak (*Quercus michauxii*)	15.4%
Persimmon (*Diospyros virginiana*)	53.8%
American Beautyberry (*Callicarpa americana*)	15.4%

Density:

Total Number of Trees **13** / **0.025 acres** = **520** **trees / acre**

Survivability:

Total Number of Trees **13** / **16** **x 100** = **81** **% survivability**

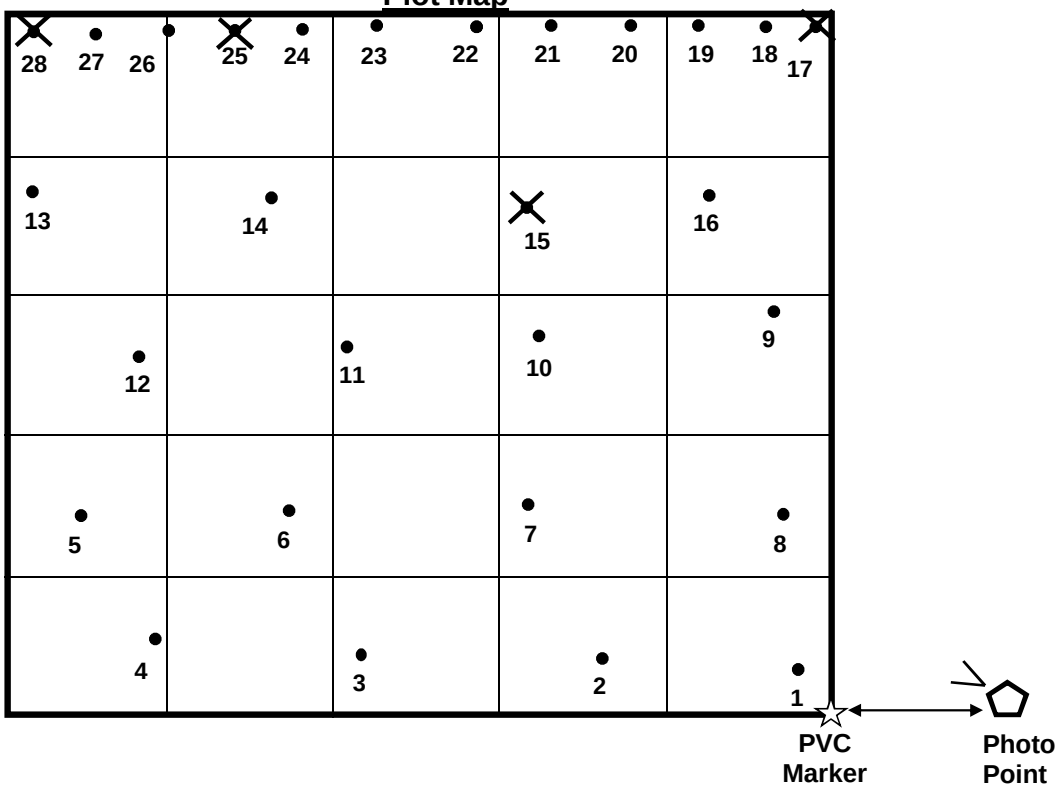
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S15 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	River Birch (*Betula nigra*)	1.47	4	
2	River Birch (*Betula nigra*)	1.65	4	
3	River Birch (*Betula nigra*)	2.20	4	
4	River Birch (*Betula nigra*)	1.47	4	
5	Sugarberry (*Celtis laevigata*)	0.26	3	Browsed
6	Sugarberry (*Celtis laevigata*)	0.61	3	
7	Swamp Chestnut Oak (*Quercus michauxii*)	0.32	3	
8	Sugarberry (*Celtis laevigata*)	0.31	2	
9	American Beautyberry (*Callicarpa americana*)	0.40	3	
10	Sycamore (*Platanus occidentalis*)	0.88	4	
11	Sycamore (*Platanus occidentalis*)	0.60	4	Main stem died back
12	Sycamore (*Platanus occidentalis*)	0.67	3	Insect damage
13	American Beautyberry (*Callicarpa americana*)	0.35	3	
14	American Beautyberry (*Callicarpa americana*)	0.25	2	
15	American Beautyberry (*Callicarpa americana*)			Dead
16	American Beautyberry (*Callicarpa americana*)	0.21	2	
17	Silky Dogwood (*Cornus amomum)*			Live stake, dead
18	Silky Dogwood (*Cornus amomum)*	0.41	3	Live stake
19	Silky Dogwood (*Cornus amomum)*	0.42	3	Live stake
20	Silky Dogwood (*Cornus amomum)*	0.35	3	Live stake
21	Silky Dogwood (*Cornus amomum)*	1.75	3	Live stake
22	Silky Dogwood (*Cornus amomum)*	0.87	3	Live stake
23	Silky Dogwood (*Cornus amomum)*	0.98	3	Live stake
24	Silky Dogwood (*Cornus amomum)*	0.51	3	Live stake, Insect damage
25	Elderberry (*Sambucus canadensis*)			Live stake, dead
26	Silky Dogwood (*Cornus amomum)*	0.44	3	Live stake, Deer browse
27	Silky Dogwood (*Cornus amomum)*	0.64	4	Live stake, Deer browse
28	Elderberry (*Sambucus canadensis*)			Live stake, dead

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Silky Dogwood (*Cornus amomum*)	37.5%
River Birch (*Betula nigra*)	16.7%
Sycamore (*Platanus occidentalis*)	12.5%
Sugarberry (*Celtis laevigata*)	12.5%
Swamp Chestnut Oak (*Quercus michauxii*)	4.2%
American Beautyberry (*Callicarpa americana*)	16.7%

Density:

Total Number of Trees **24** / **0.025 acres** = **960** **trees / acre**

Survivability:

Total Number of Trees **24** / **28** x **100** = **86** **% survivability**

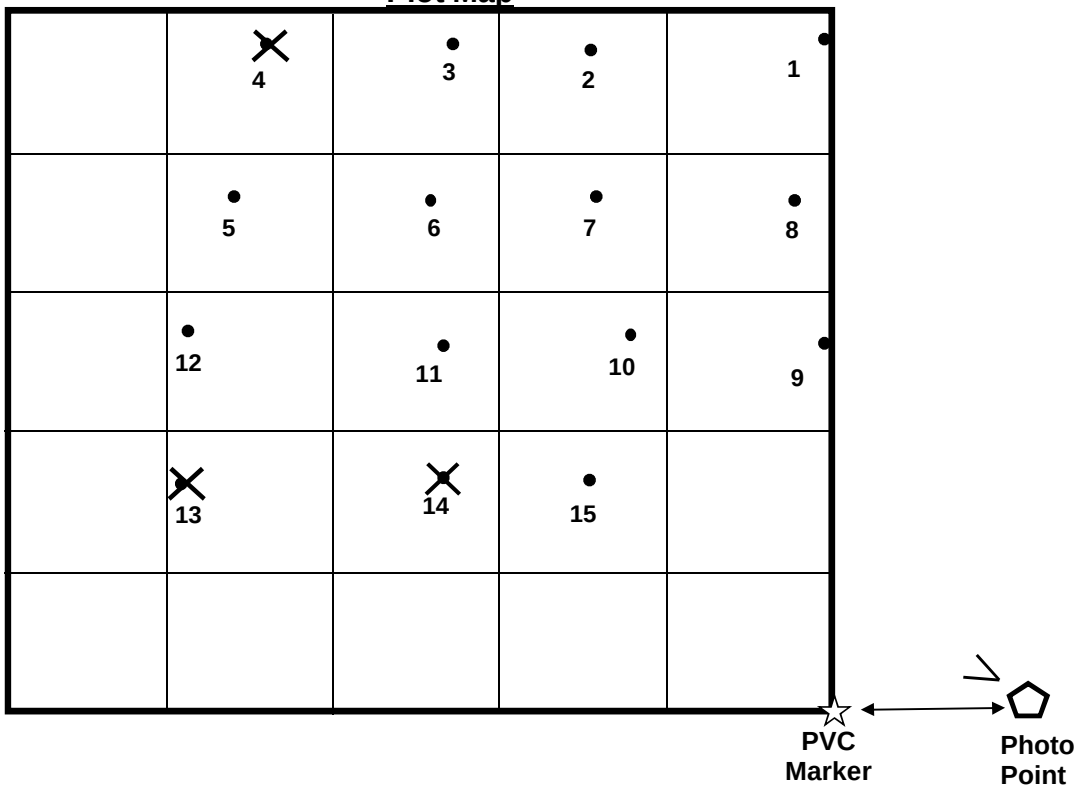
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S16 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	American Beautyberry (*Callicarpa americana*)	0.55	3	
2	Persimmon (*Diospyros virginiana*)	0.38	2	
3	American Beautyberry (*Callicarpa americana*)	0.70	4	
4	Willow Oak (*Quercus phellos*)			Dead
5	American Beautyberry (*Callicarpa americana*)	-	1	Stem dead; check for resprout
6	American Beautyberry (*Callicarpa americana*)	-	1	Stem dead; check for resprout
7	Swamp Chestnut Oak (*Quercus michauxii*)	-	1	Stem dead; check for resprout
8	Swamp Chestnut Oak (*Quercus michauxii*)	0.50	4	
9	Sycamore (*Platanus occidentalis*)	1.93	4	
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.19	2	Resprout
11	Swamp Chestnut Oak (*Quercus michauxii*)	0.31	3	
12	Swamp Chestnut Oak (*Quercus michauxii*)	0.20	2	
13	River Birch (*Betula nigra*)			Dead
14	Unknown			Dead
15	River Birch (*Betula nigra*)	1.70	4	

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
American Beautyberry (*Callicarpa americana*)	33.3%
Sycamore (*Platanus occidentalis*)	8.3%
River Birch (*Betula nigra*)	8.3%
Persimmon (*Diospyros virginiana*)	8.3%
Swamp Chestnut Oak (*Quercus michauxii*)	41.7%

Density:

Total Number of Trees **12** / **0.025 acres** = **480** **trees / acre**

Survivability:

Total Number of Trees **12** / **15** x **100** = **80** **% survivability**

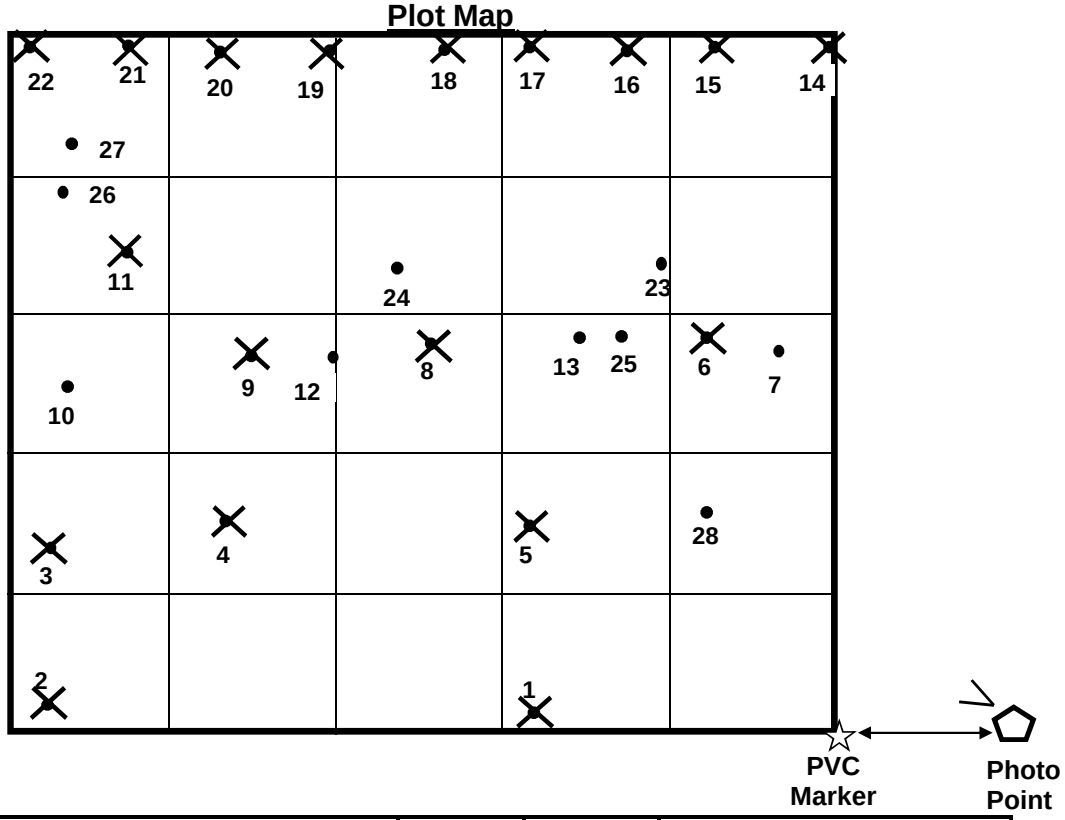
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S17 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
2	Sugarberry (*Celtis laevigata*)			Dead
3	Unknown			Dead
4	Willow Oak (*Quercus phellos*)			Dead
5	Sugarberry (*Celtis laevigata*)			Dead
6	Persimmon (*Diospyros virginiana*)			Dead
7	Persimmon (*Diospyros virginiana*)	1.47	4	Fungus, insect damage
8	Persimmon (*Diospyros virginiana*)			Dead
9	Swamp Chestnut Oak (*Quercus michauxii*)			Dead
10	Swamp Chestnut Oak (*Quercus michauxii*)	1.34	4	
11	Willow Oak (*Quercus phellos*)			Dead
12	Swamp Chestnut Oak (*Quercus michauxii*)	0.25	2	
13	Swamp Chestnut Oak (*Quercus michauxii*)	0.61	3	
14	Silky Dogwood (*Cornus amomum*)			Live stake, dead
15	Elderberry (*Sambucus canadensis*)			Live stake, dead
16	Black Willow (*Salix nigra*)			Live stake, dead
17	Elderberry (*Sambucus canadensis*)			Live stake, dead
18	Elderberry (*Sambucus canadensis*)			Live stake, dead
19	Elderberry (*Sambucus canadensis*)			Live stake, dead
20	Elderberry (*Sambucus canadensis*)			Live stake, dead
21	Elderberry (*Sambucus canadensis*)			Live stake, dead
22	Silky Dogwood (*Cornus amomum*)			Live stake, dead
23	Green Ash (*Fraxinus pennsylvanica*)	0.41	3	Recently planted; added; insect damage
24	Green Ash (*Fraxinus pennsylvanica*)	0.33	3	Recently planted; added
25	Bald Cypress (*Taxodium distichum*)	0.60	3	Recently planted; added
26	Green Ash (*Fraxinus pennsylvanica*)	0.38	3	Recently planted; added
27	Sugarberry (*Celtis laevigata*)	0.19	2	Recently planted; added
28	Bald Cypress (*Taxodium distichum*)	0.65	2	Recently planted; added

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
Persimmon (Diospyros virginiana)	10.0%
Swamp Chestnut Oak (*Quercus michauxii*)	30.0%
Sugarberry (*Celtis laevigata*)	10.0%
Green Ash (*Fraxinus pennsylvanica*)	30.0%
Bald Cypress (*Taxodium distichum*)	20.0%

Density:

Total Number of Trees **10** / **0.025 acres** = **400** **trees / acre**

Survivability:

Total Number of Trees **10** / **28** **x** **100** = **45** **% survivability**

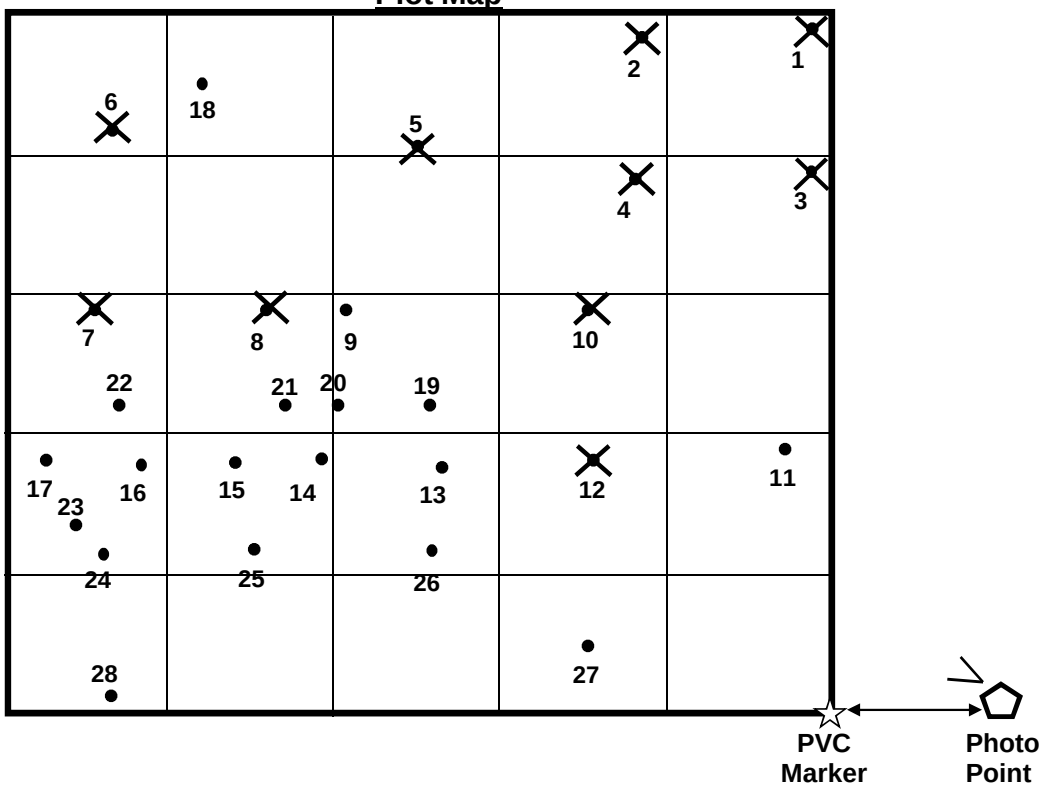
2nd Year Monitoring

3rd Year Monitoring

Vegetation Monitoring Worksheet

Site: Harrell **Plot:** S18 **Date:** 7/26/2010

Plot Map



ID	Species	Height (m)	Vigor	Comment
1	River Birch (*Betula nigra*)			Dead
2	River Birch (*Betula nigra*)			Dead
3	Unknown			Dead
4	*Quercus sp.*			Dead
5	American Beautyberry (*Callicarpa americana*)			Dead
6	Willow Oak (*Quercus phellos*)			Dead
7	American Beautyberry (*Callicarpa americana*)			Dead
8	American Beautyberry (*Callicarpa americana*)			Dead
9	Green Ash (*Fraxinus pennsylvanica*)	0.53	4	Main stem died back
10	American Beautyberry (*Callicarpa americana*)			Dead
11	River Birch (*Betula nigra*)	0.81	2	
12	River Birch (*Betula nigra*)			Dead
13	River Birch (*Betula nigra*)	0.80	2	Resprout
14	Willow Oak (*Quercus phellos*)	0.49	4	
15	River Birch (*Betula nigra*)	0.92	3	
16	River Birch (*Betula nigra*)	0.89	2	
17	Willow Oak (*Quercus phellos*)	0.40	3	Deer browse
18	Green Ash (*Fraxinus pennsylvanica*)	0.11	2	Recently planted; added
19	Green Ash (*Fraxinus pennsylvanica*)	0.29	3	Recently planted; added
20	Green Ash (*Fraxinus pennsylvanica*)	0.53	3	Recently planted; added
21	Green Ash (*Fraxinus pennsylvanica*)	0.34	3	Recently planted; added
22	Green Ash (*Fraxinus pennsylvanica*)	0.36	3	Recently planted; added
23	Green Ash (*Fraxinus pennsylvanica*)	0.19	2	Recently planted; added
24	Sugarberry (*Celtis laevigata*)	0.59	3	Recently planted; added
25	Sugarberry (*Celtis laevigata*)	0.56	3	Recently planted; added
26	Sugarberry (*Celtis laevigata*)	0.58	3	Recently planted; added
27	Sugarberry (*Celtis laevigata*)	0.60	3	Recently planted; added
28	Green Ash (*Fraxinus pennsylvanica*)	0.35	4	Recently planted; added

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year

Species	Percent of Total
River Birch (*Betula nigra*)	22.2%
Willow Oak (*Quercus phellos*)	11.1%
Green Ash (*Fraxinus pennsylvanica*)	44.4%
Sugarberry (Celtis laevigata)	22.2%

Density:

Total Number of Trees **18** / **0.025 acres** = **720** **trees / acre**

Survivability:

Total Number of Trees **18** / **28** **x** **100** = **64** **% survivability**

2nd Year Monitoring

3rd Year Monitoring

Appendix B
Stream and Wetland Photos

Appendix B1 – Stream and Wetland Photo Stations

Photo Point S1: View looking upstream near Station 12+75. 12/6/10 – MY-03

Photo Point S1: View looking downstream near Station 12+75. 12/6/10 – MY-03

Photo Point S2: View looking upstream from farm road near Station 21+30. 12/6/10 – MY-03

Photo Point S2: View looking downstream from farm road near Station 21+30. 12/6/10 – MY-03

Photo Point S3: View looking upstream near Station 27+60. 12/6/10 – MY-03

Photo Point S3: View looking downstream near Station 27+60. 12/6/10 – MY-03

Photo Point S4: View of water quality treatment structure near Station 32+25. 12/6/10 – MY-03

Photo Point S5: View looking at log drop structures, near Station 33+35. 12/6/10 – MY-03

Photo Point S5: View looking downstream near Station 33+35. 12/6/10 – MY-03

Photo Point S6: View of incoming drainage ditch near Station 37+25. 12/6/10 – MY-03

Photo Point S7: View looking upstream near Station 39+00. 12/6/10 – MY-03

Photo Point S7: View looking downstream near Station 39+00. 12/6/10 – MY-03

Photo Point S8: View of log drop structure near Station 39+50. 12/6/10 – MY-03

Photo Point S9: View of water quality treatment structure near Station 41+75. 12/6/10 – MY-03

Photo Point S10: View looking upstream near Station 46+15. 12/6/10 – MY-03

Photo Point S10: View looking downstream near Station 46+15. 12/6/10 – MY-03

Photo Point S11: View of water quality treatment structure near Station 47+00. 12/6/10 – MY-03

Photo Point S12: View looking upstream near Station 52+00. 12/6/10 – MY-03

Photo Point S12: View looking downstream near Station 52+00. 12/6/10 – MY-03

Photo Point S13: View looking upstream near Station 61+50. 12/6/10 – MY-03

Photo Point S13: View of water quality treatment structure near Station 61+50. 12/6/10 – MY-03

Photo Point S13: View looking downstream near Station 61+50. 12/6/10 – MY-03

Photo Point S14: View of stream with water quality treatment structure in the background near Station 62+60. 12/6/10 – MY-03

Photo Point S15: View looking upstream near Station 69+00. 12/6/10 – MY-03

Photo Point S15: View looking downstream near Station 69+00. 12/6/10 – MY-03

Photo Point S16: View looking upstream near Station 76+75. (Photo taken farther away from stream due to water depth) 12/6/10 – MY-03

Photo Point S16: View looking downstream toward project end before the stream joins Swift Creek near Station 76+75. (Photo taken farther away from stream due to water depth) 12/6/10 – MY-03

Photo Point W1: View looking north from southwest corner of wetland. 12/6/10 – MY-03

Photo Point W1: View looking east from southwest corner of wetland. 12/6/10 – MY-03

Photo Point W2: View looking east from northwest corner of wetland. 12/6/10 – MY-03

Photo Point W2: View looking southeast from northwest corner of wetland. 12/6/10 – MY-03

Photo Point W3: View looking east from middle corner of wetland. 12/6/10 – MY-03

Photo Point W3: View looking west from middle corner of wetland. 12/6/10 – MY-03

Photo Point W3: View looking southwest from middle corner of wetland. 12/6/10 – MY-03

Photo Point W4: View looking north toward Wetland Gauge 1. 12/6/10 – MY-03

Photo Point W5: View looking west toward the downstream end of site. 12/6/10 – MY-03

Appendix B2: Representative Stream Problem Area Photos

There were no problem area photos taken in 2010, the third year of monitoring.

Appendix C
Geomorphologic and Hydrologic Data

Appendix C1 – Cross-Section Plots

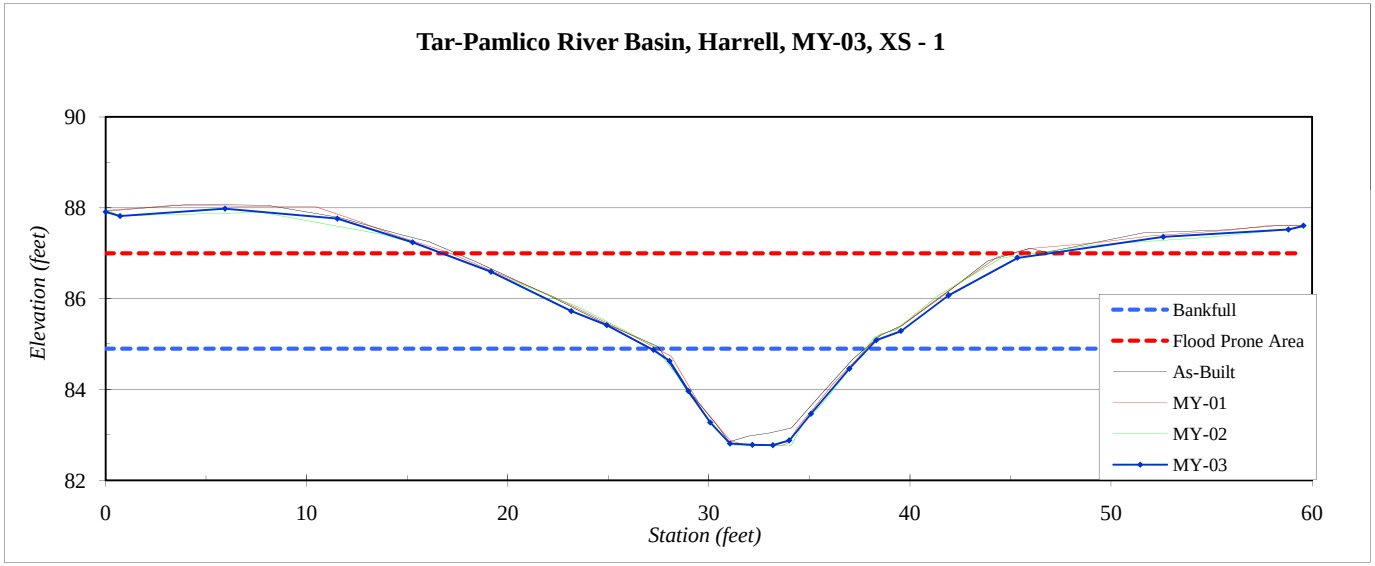
C1 - Stream Cross-Sections

River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 1
Drainage Area (sq mi):	0.20
Date:	6/28/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	87.91
0.7	87.82
5.9	87.98
11.5	87.76
15.3	87.24
19.2	86.59
23.2	85.73
24.9	85.41
27.2	84.87
28.0	84.62
29.0	83.96
30.1	83.27
31.0	82.81
32.2	82.78
33.2	82.77
34.0	82.88
35.1	83.46
37.0	84.46
38.3	85.08
39.5	85.28
41.9	86.07
45.4	86.90
52.6	87.36
58.8	87.52
59.6	87.60

SUMMARY DATA	
Bankfull Elevation:	84.9
Bankfull Cross-Sectional Area:	14.0
Bankfull Width:	10.8
Flood Prone Area Elevation:	87.0
Flood Prone Width:	31
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.3
W / D Ratio:	8.3
Entrenchment Ratio:	2.9
Bank Height Ratio:	1.0

Stream Type	B5c

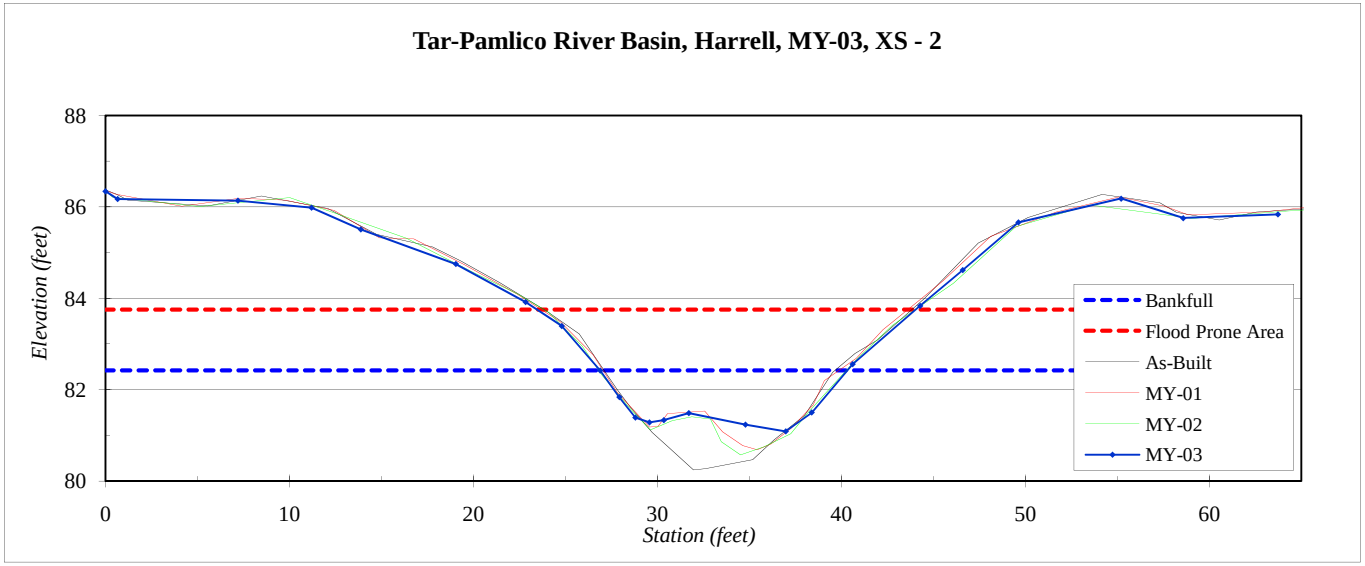


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 2
Drainage Area (sq mi):	0.20
Date:	6/28/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	86.34
0.7	86.17
7.2	86.14
11.2	85.98
13.9	85.51
19.0	84.75
22.8	83.92
24.8	83.39
26.9	82.42
27.9	81.83
28.8	81.39
29.6	81.28
30.3	81.33
31.7	81.49
34.8	81.23
37.0	81.09
38.4	81.50
40.6	82.56
44.3	83.83
46.6	84.62
49.6	85.66
55.2	86.18
58.6	85.75
63.7	85.84

SUMMARY DATA	
Bankfull Elevation:	82.4
Bankfull Cross-Sectional Area:	12.6
Bankfull Width:	13.4
Flood Prone Area Elevation:	83.8
Flood Prone Width:	20
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.5
Entrenchment Ratio:	1.5
Bank Height Ratio:	1.0

Stream Type	B5c

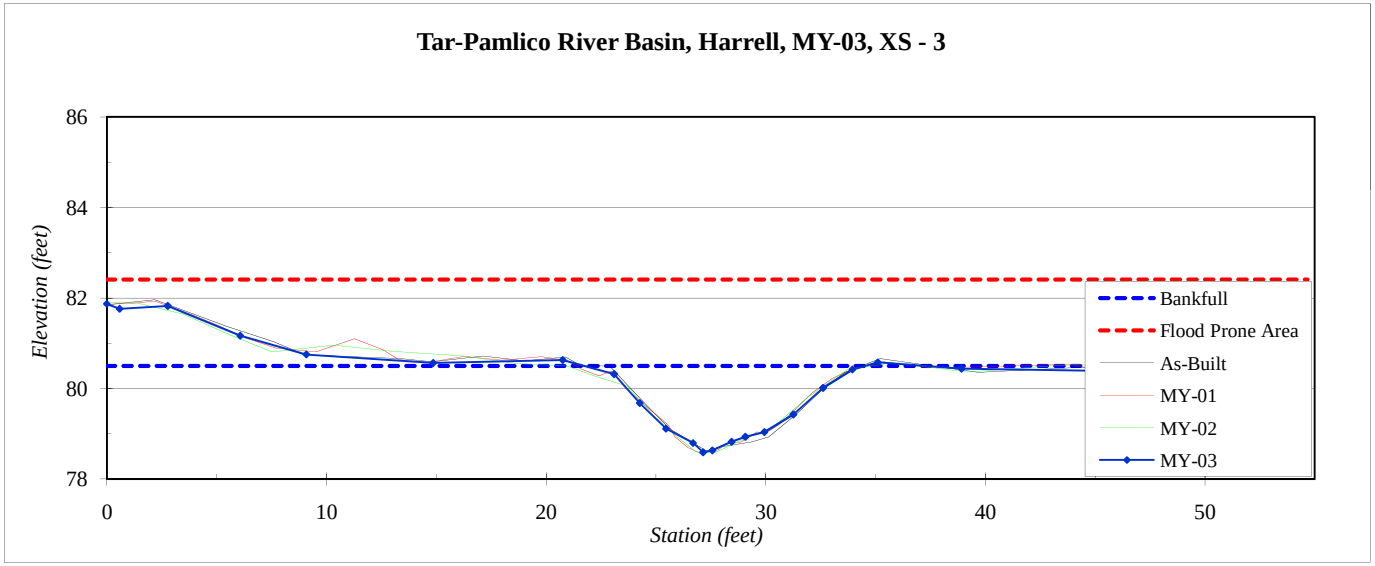


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 3
Drainage Area (sq mi):	0.23
Date:	6/28/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	81.87
0.6	81.76
2.8	81.82
6.1	81.17
9.1	80.75
14.9	80.56
20.8	80.63
23.1	80.32
24.3	79.68
25.5	79.11
26.7	78.80
27.2	78.59
27.6	78.63
28.4	78.82
29.1	78.93
29.9	79.04
31.3	79.43
32.6	80.01
33.9	80.42
35.1	80.58
38.9	80.44
45.4	80.39
51.4	80.52
54.1	80.82
54.7	80.95

SUMMARY DATA	
Bankfull Elevation:	80.5
Bankfull Cross-Sectional Area:	12.6
Bankfull Width:	12.8
Flood Prone Area Elevation:	82.4
Flood Prone Width:	>55
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.0
W / D Ratio:	13.5
Entrenchment Ratio:	>4.3
Bank Height Ratio:	1.0

Stream Type	C5

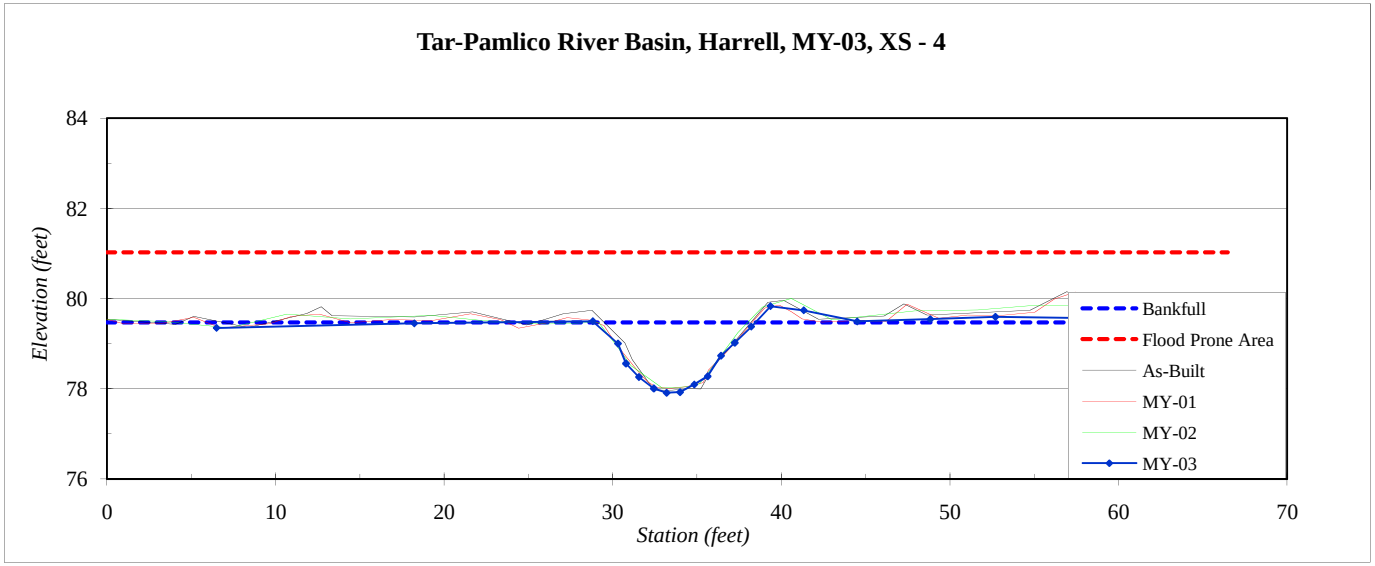


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 4
Drainage Area (sq mi):	0.23
Date:	6/28/2010
Field Crew:	A. French, L. Lord

Station	Elevation
6.5	79.35
18.2	79.45
28.8	79.50
30.3	79.00
30.8	78.56
31.6	78.26
32.4	78.01
33.2	77.91
34.0	77.93
34.8	78.10
35.6	78.28
36.4	78.73
37.2	79.02
38.2	79.38
39.4	79.83
41.3	79.74
44.5	79.49
48.8	79.54
52.7	79.59
59.5	79.56
64.1	79.68
65.9	79.69
66.5	79.93

SUMMARY DATA	
Bankfull Elevation:	79.5
Bankfull Cross-Sectional Area:	8.8
Bankfull Width:	9.3
Flood Prone Area Elevation:	81.0
Flood Prone Width:	>67
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.9
W / D Ratio:	9.9
Entrenchment Ratio:	>6.5
Bank Height Ratio:	1.0

Stream Type	C5

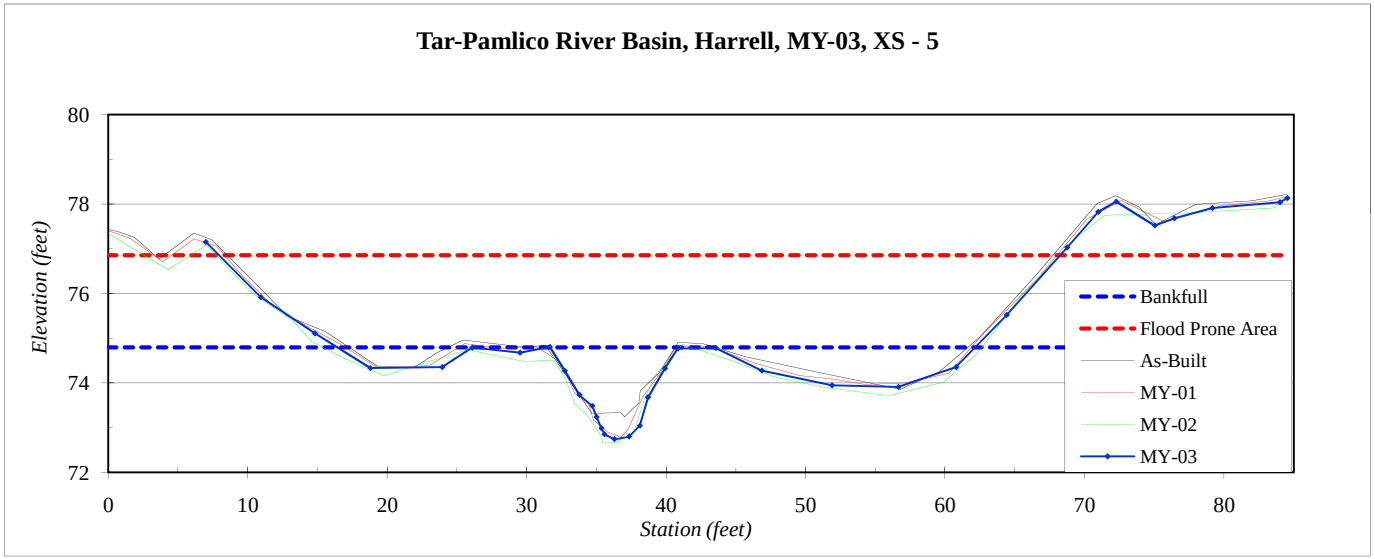


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 5
Drainage Area (sq mi):	0.23
Date:	6/29/2010
Field Crew:	A. French, L. Lord

Station	Elevation
7.0	77.15
10.9	75.91
14.8	75.11
18.8	74.33
24.0	74.35
26.1	74.79
29.5	74.68
31.7	74.81
32.7	74.27
33.8	73.73
34.7	73.48
35.0	73.24
35.4	72.99
35.6	72.85
36.3	72.74
37.3	72.80
38.1	73.05
38.7	73.68
39.9	74.33
40.9	74.77
43.6	74.78
46.9	74.28
51.9	73.95
56.7	73.91
60.8	74.36
64.4	75.52
68.8	77.03
71.0	77.83
72.3	78.06
75.0	77.52
76.5	77.68
79.2	77.91
84.0	78.04
84.5	78.13

SUMMARY DATA	
Bankfull Elevation:	74.8
Bankfull Cross-Sectional Area:	10.7
Bankfull Width:	9.2
Flood Prone Area Elevation:	76.9
Flood Prone Width:	60
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.2
W / D Ratio:	7.8
Entrenchment Ratio:	6.6
Bank Height Ratio:	1.0

Stream Type	C5

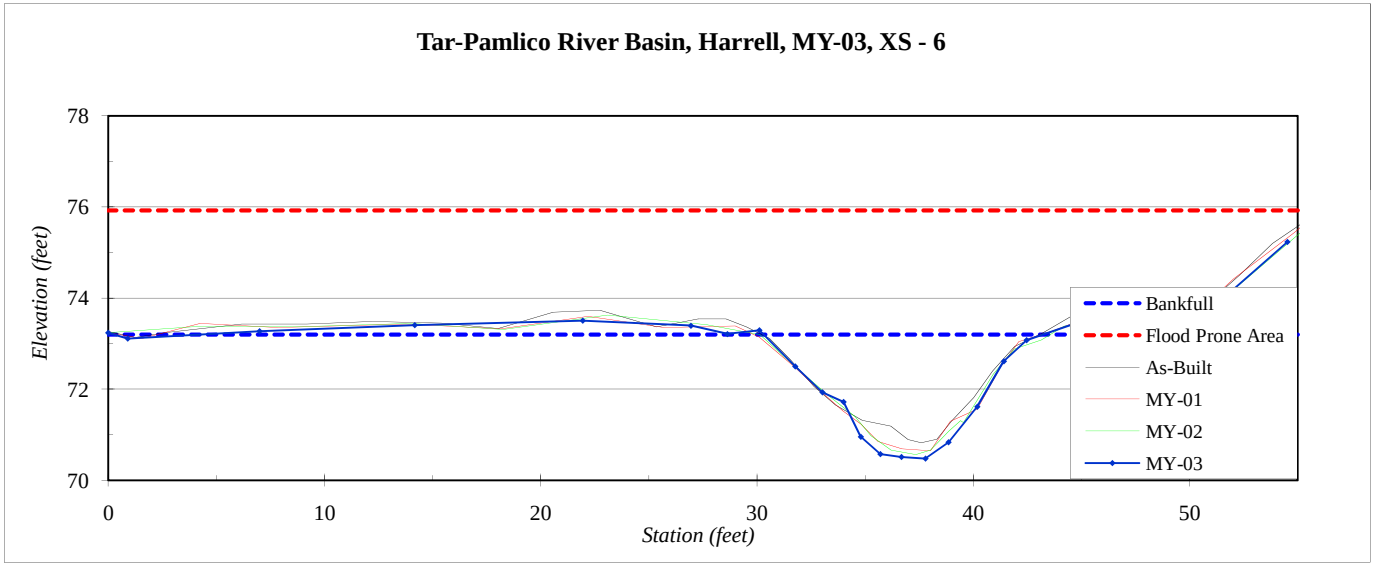


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 6
Drainage Area (sq mi):	0.42
Date:	6/29/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	73.24
0.9	73.11
7.0	73.27
14.2	73.40
21.9	73.50
26.9	73.39
28.6	73.21
30.1	73.29
31.8	72.50
33.0	71.93
34.0	71.72
34.8	70.96
35.7	70.57
36.7	70.51
37.8	70.48
38.9	70.83
40.2	71.62
41.4	72.61
42.5	73.08
45.1	73.50
47.1	73.26
50.1	73.39
54.5	75.23

SUMMARY DATA	
Bankfull Elevation:	73.2
Bankfull Cross-Sectional Area:	19.5
Bankfull Width:	12.9
Flood Prone Area Elevation:	75.9
Flood Prone Width:	>56
Max Depth at Bankfull:	2.7
Mean Depth at Bankfull:	1.5
W / D Ratio:	8.5
Entrenchment Ratio:	>4.2
Bank Height Ratio:	1.0

Stream Type	C5

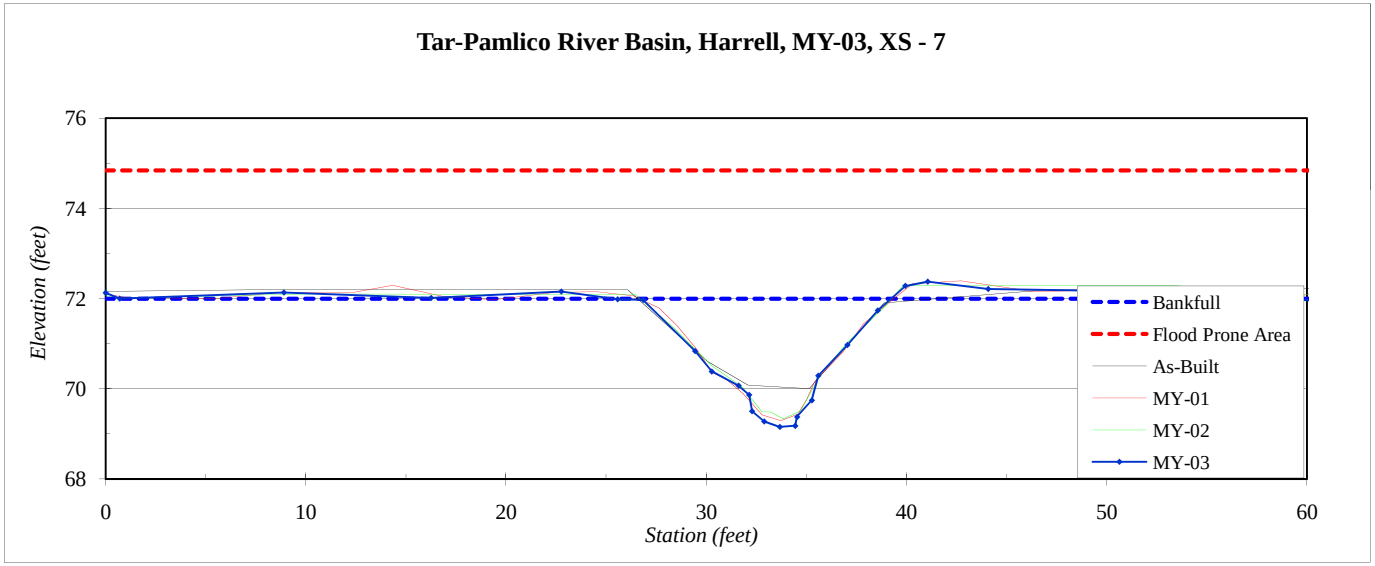


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 7
Drainage Area (sq mi):	0.42
Date:	6/29/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	72.13
0.7	72.00
8.9	72.14
16.3	72.01
22.8	72.15
25.6	71.98
26.8	71.97
29.4	70.84
30.3	70.39
31.6	70.07
32.1	69.87
32.3	69.50
32.9	69.28
33.7	69.16
34.4	69.18
34.5	69.38
35.3	69.75
35.6	70.29
37.1	70.97
38.6	71.74
39.9	72.28
41.1	72.38
44.1	72.22
49.0	72.18
54.2	72.09
60.4	71.96
60.9	72.13

SUMMARY DATA	
Bankfull Elevation:	72.0
Bankfull Cross-Sectional Area:	18.2
Bankfull Width:	12.4
Flood Prone Area Elevation:	74.8
Flood Prone Width:	>61
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.5
W / D Ratio:	8.4
Entrenchment Ratio:	>4.8
Bank Height Ratio:	1.0

Stream Type	C5

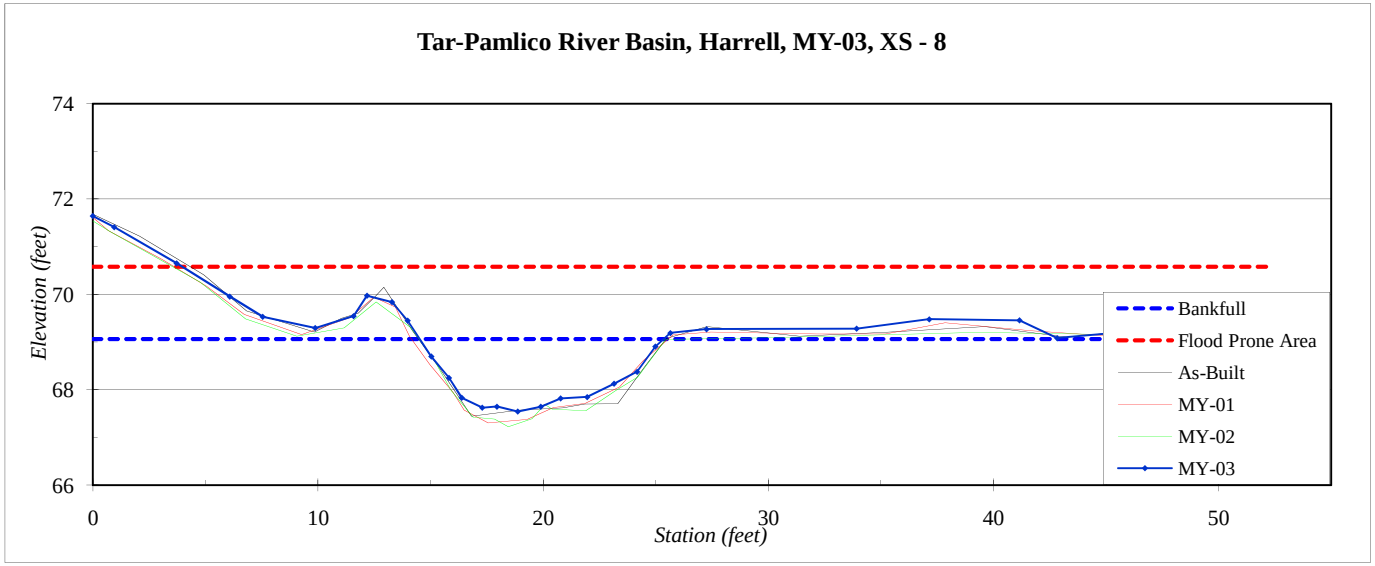


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 8
Drainage Area (sq mi):	0.42
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	71.65
1.0	71.41
3.7	70.65
6.1	69.96
7.6	69.53
9.9	69.29
11.6	69.55
12.2	69.97
13.3	69.84
14.0	69.45
15.0	68.70
15.8	68.25
16.4	67.83
17.3	67.62
18.0	67.65
18.9	67.54
19.9	67.64
20.8	67.82
22.0	67.85
23.1	68.13
24.2	68.38
25.0	68.90
25.7	69.19
27.3	69.27
33.9	69.28
37.2	69.48
41.2	69.45
42.8	69.08
46.5	69.24
47.6	69.52
48.6	69.35
50.6	69.14
52.1	69.14
52.3	69.20

SUMMARY DATA	
Bankfull Elevation:	69.1
Bankfull Cross-Sectional Area:	11.2
Bankfull Width:	10.8
Flood Prone Area Elevation:	70.6
Flood Prone Width:	>50
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	1.0
W / D Ratio:	10.4
Entrenchment Ratio:	>4.4
Bank Height Ratio:	1.0

Stream Type	C5

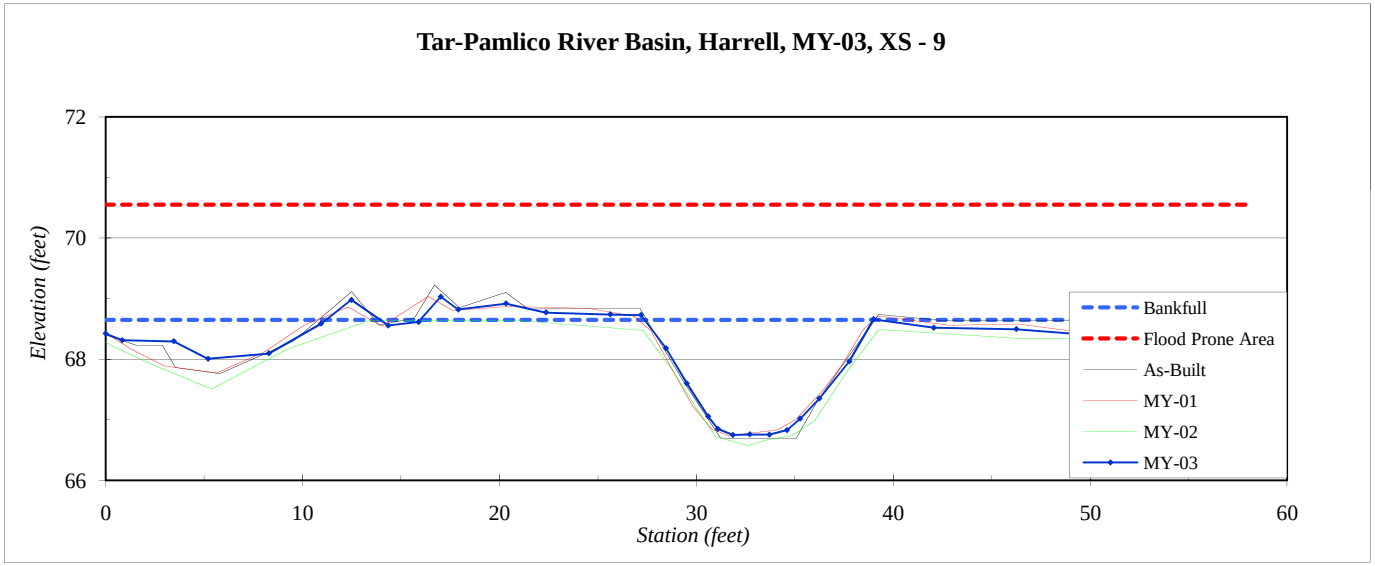


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 9
Drainage Area (sq mi):	0.42
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	68.42
0.9	68.31
3.5	68.29
5.2	68.01
8.3	68.09
10.9	68.59
12.5	68.98
14.4	68.55
15.9	68.61
17.0	69.03
17.9	68.82
20.3	68.92
22.4	68.77
25.6	68.74
27.2	68.73
28.5	68.18
29.5	67.60
30.6	67.05
31.1	66.85
31.8	66.75
32.7	66.76
33.7	66.75
34.6	66.83
35.3	67.01
36.2	67.35
37.8	67.96
39.0	68.66
42.1	68.52
46.3	68.49
50.7	68.38
54.4	68.36
57.8	68.34
58.2	68.47

SUMMARY DATA	
Bankfull Elevation:	68.7
Bankfull Cross-Sectional Area:	14.4
Bankfull Width:	11.6
Flood Prone Area Elevation:	70.6
Flood Prone Width:	>58
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.2
W / D Ratio:	9.3
Entrenchment Ratio:	>5.9
Bank Height Ratio:	1.0

Stream Type	C5

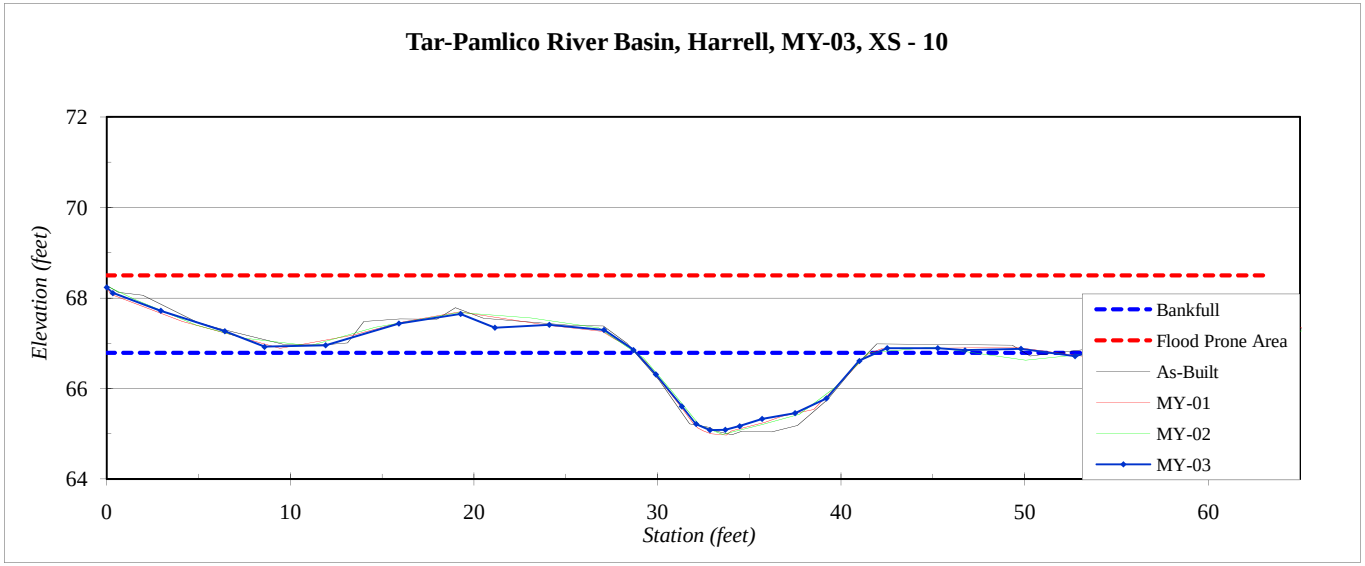


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 10
Drainage Area (sq mi):	0.61
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	68.24
0.3	68.11
2.9	67.72
6.4	67.26
8.6	66.92
11.9	66.96
15.9	67.44
19.3	67.65
21.1	67.35
24.1	67.41
27.1	67.29
28.7	66.85
29.9	66.31
31.3	65.61
32.1	65.22
32.9	65.08
33.7	65.09
34.5	65.17
35.7	65.33
37.5	65.46
39.2	65.78
41.0	66.61
42.5	66.89
45.3	66.89
46.8	66.85
49.8	66.88
52.7	66.71
57.1	67.20
61.4	67.01
63.4	67.23

SUMMARY DATA	
Bankfull Elevation:	66.8
Bankfull Cross-Sectional Area:	14.0
Bankfull Width:	13.1
Flood Prone Area Elevation:	68.5
Flood Prone Width:	>67
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.1
W / D Ratio:	12.3
Entrenchment Ratio:	>4.8
Bank Height Ratio:	1.0

Stream Type	C5

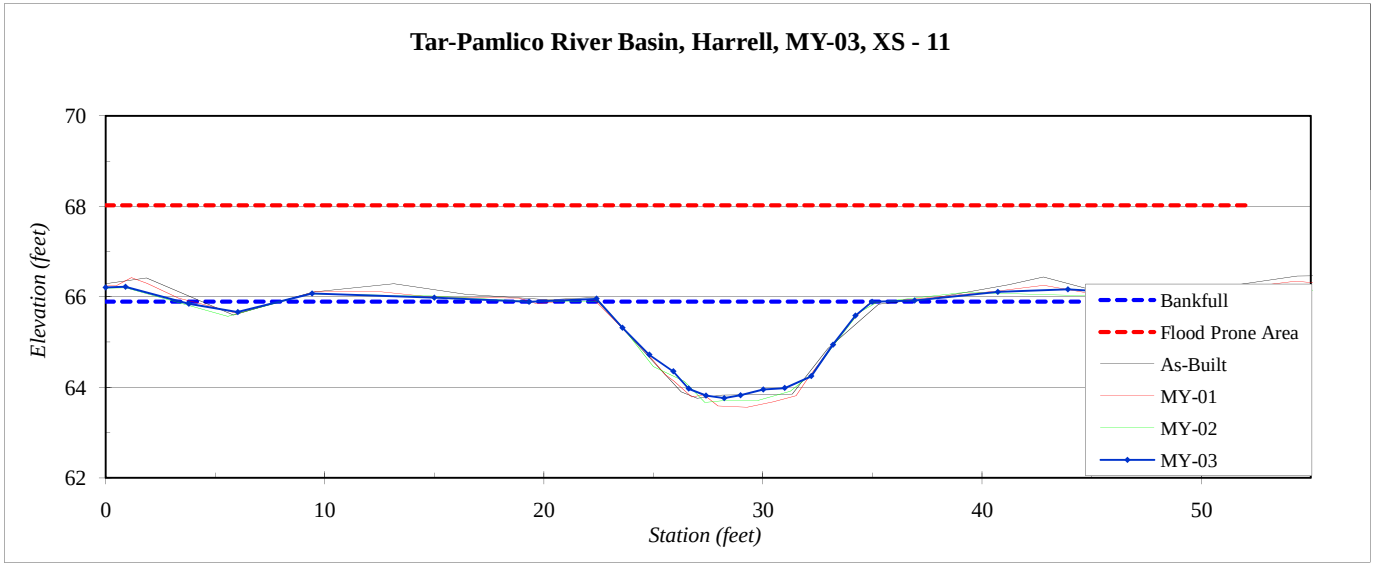


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 11
Drainage Area (sq mi):	0.61
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	66.21
0.9	66.22
3.8	65.85
6.0	65.66
9.4	66.07
15.0	65.98
19.3	65.89
22.4	65.96
23.6	65.31
24.8	64.72
25.9	64.35
26.6	63.97
27.4	63.81
28.2	63.76
29.0	63.82
30.0	63.95
31.0	63.98
32.2	64.25
33.2	64.94
34.2	65.58
35.0	65.89
36.9	65.92
40.7	66.11
43.9	66.17
47.2	66.06
52.4	66.18

SUMMARY DATA	
Bankfull Elevation:	65.9
Bankfull Cross-Sectional Area:	17.1
Bankfull Width:	12.7
Flood Prone Area Elevation:	68.0
Flood Prone Width:	>57
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.3
W / D Ratio:	9.4
Entrenchment Ratio:	>4.1
Bank Height Ratio:	1.0

Stream Type	C5

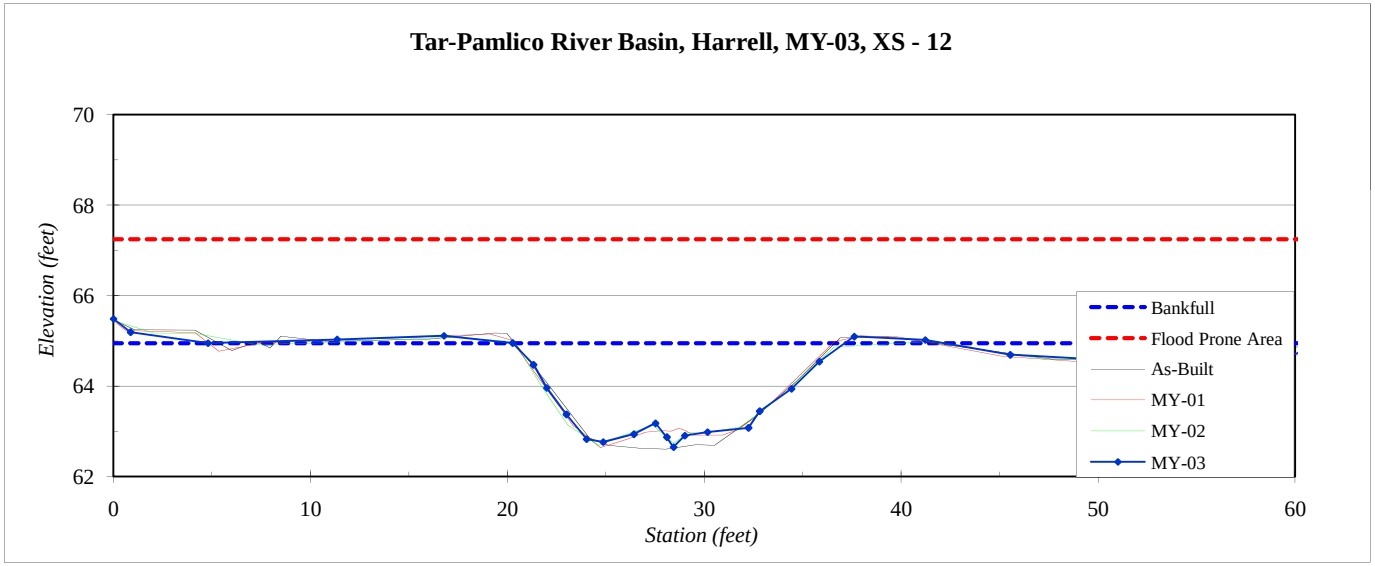


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 12
Drainage Area (sq mi):	0.61
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	65.49
0.9	65.19
4.8	64.95
11.4	65.03
16.8	65.11
20.3	64.95
21.3	64.47
22.0	63.96
23.0	63.38
24.0	62.83
24.9	62.77
26.4	62.94
27.5	63.18
28.1	62.87
28.4	62.65
29.0	62.91
30.2	62.98
32.2	63.08
32.8	63.45
34.4	63.94
35.8	64.54
37.6	65.10
41.2	65.02
45.5	64.69
51.4	64.56
56.8	64.69
60.1	64.72
60.5	64.85

SUMMARY DATA	
Bankfull Elevation:	65.0
Bankfull Cross-Sectional Area:	24.7
Bankfull Width:	16.9
Flood Prone Area Elevation:	67.2
Flood Prone Width:	>61
Max Depth at Bankfull:	2.3
Mean Depth at Bankfull:	1.5
W / D Ratio:	11.6
Entrenchment Ratio:	>3.6
Bank Height Ratio:	1.0

Stream Type	C5

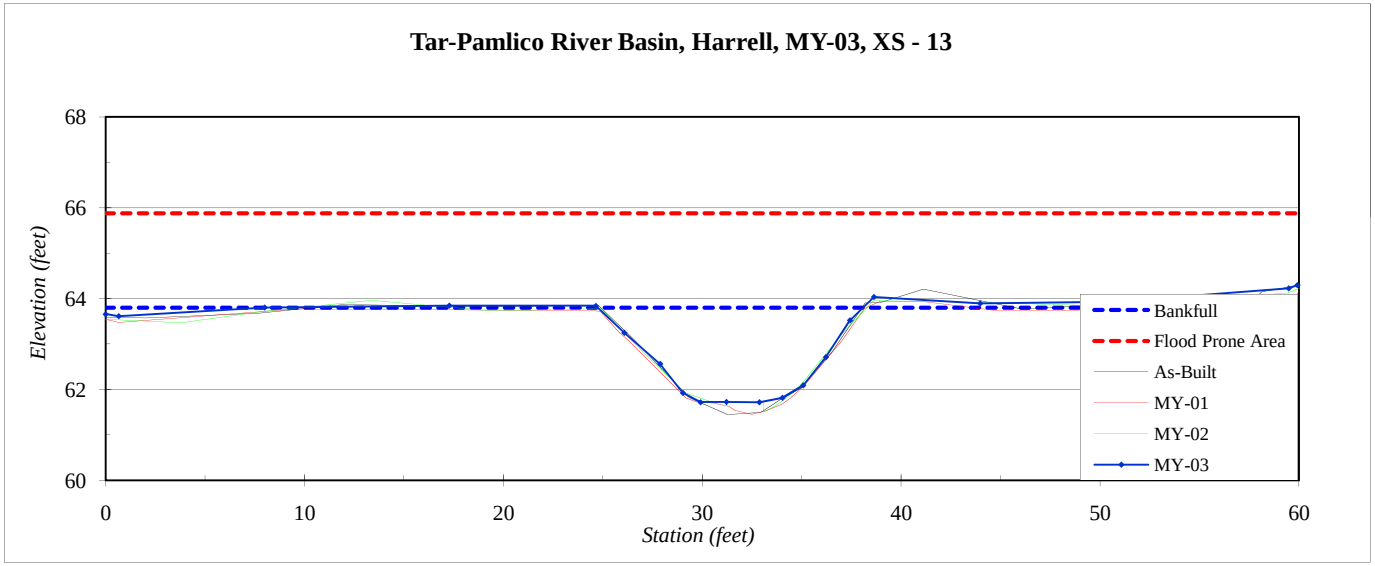


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 13
Drainage Area (sq mi):	0.61
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	63.66
0.7	63.62
8.0	63.80
17.3	63.84
24.6	63.84
26.1	63.25
27.9	62.56
29.0	61.93
29.9	61.72
31.2	61.72
32.9	61.72
34.0	61.82
35.1	62.09
36.2	62.72
37.4	63.52
38.6	64.03
44.0	63.89
50.6	63.93
59.5	64.23
59.9	64.30

SUMMARY DATA	
Bankfull Elevation:	63.8
Bankfull Cross-Sectional Area:	18.5
Bankfull Width:	13.3
Flood Prone Area Elevation:	65.9
Flood Prone Width:	>60
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.4
W / D Ratio:	9.6
Entrenchment Ratio:	>4.4
Bank Height Ratio:	1.0

Stream Type	C5

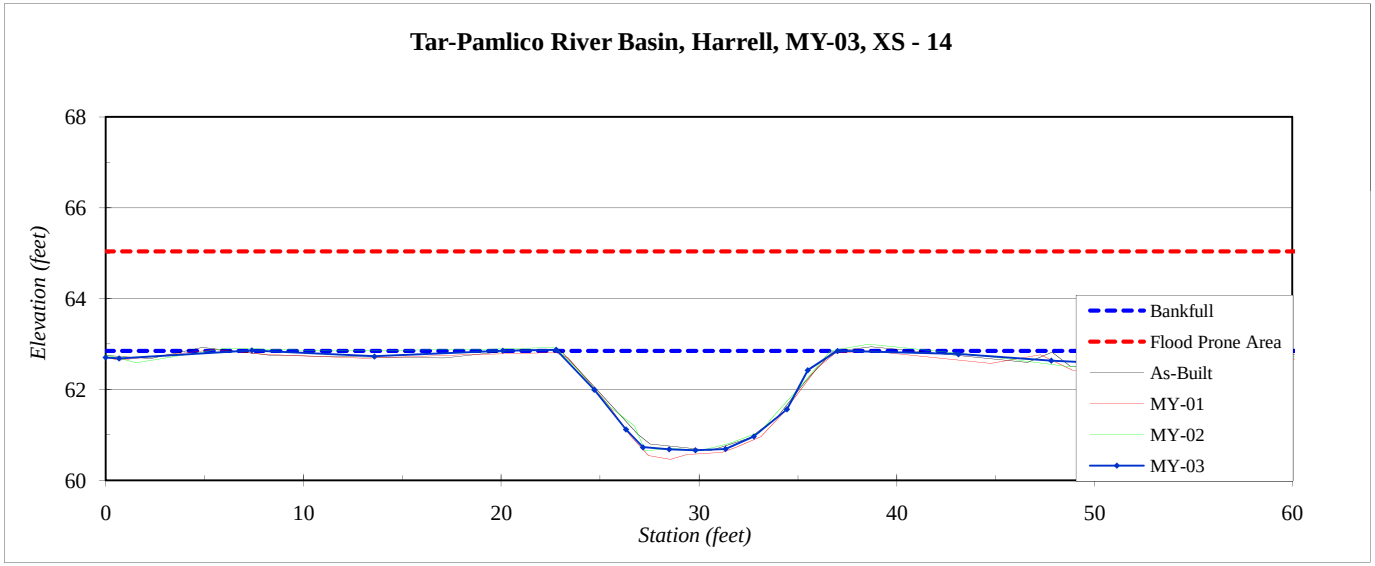


River Basin:	Tar-Pamlico
Watershed:	Harrell, MY-03
XS ID	XS - 14
Drainage Area (sq mi):	0.61
Date:	6/30/2010
Field Crew:	A. French, L. Lord

Station	Elevation
0.0	62.70
0.7	62.68
7.4	62.86
13.6	62.73
20.1	62.85
22.8	62.87
24.7	61.99
26.3	61.12
27.2	60.73
28.5	60.68
29.8	60.66
31.3	60.69
32.8	60.96
34.4	61.56
35.5	62.42
37.0	62.85
43.1	62.78
47.8	62.63
56.7	62.45

SUMMARY DATA	
Bankfull Elevation:	62.9
Bankfull Cross-Sectional Area:	20.3
Bankfull Width:	14.2
Flood Prone Area Elevation:	65.0
Flood Prone Width:	>62
Max Depth at Bankfull:	2.2
Mean Depth at Bankfull:	1.4
W / D Ratio:	9.9
Entrenchment Ratio:	>3.9
Bank Height Ratio:	1.0

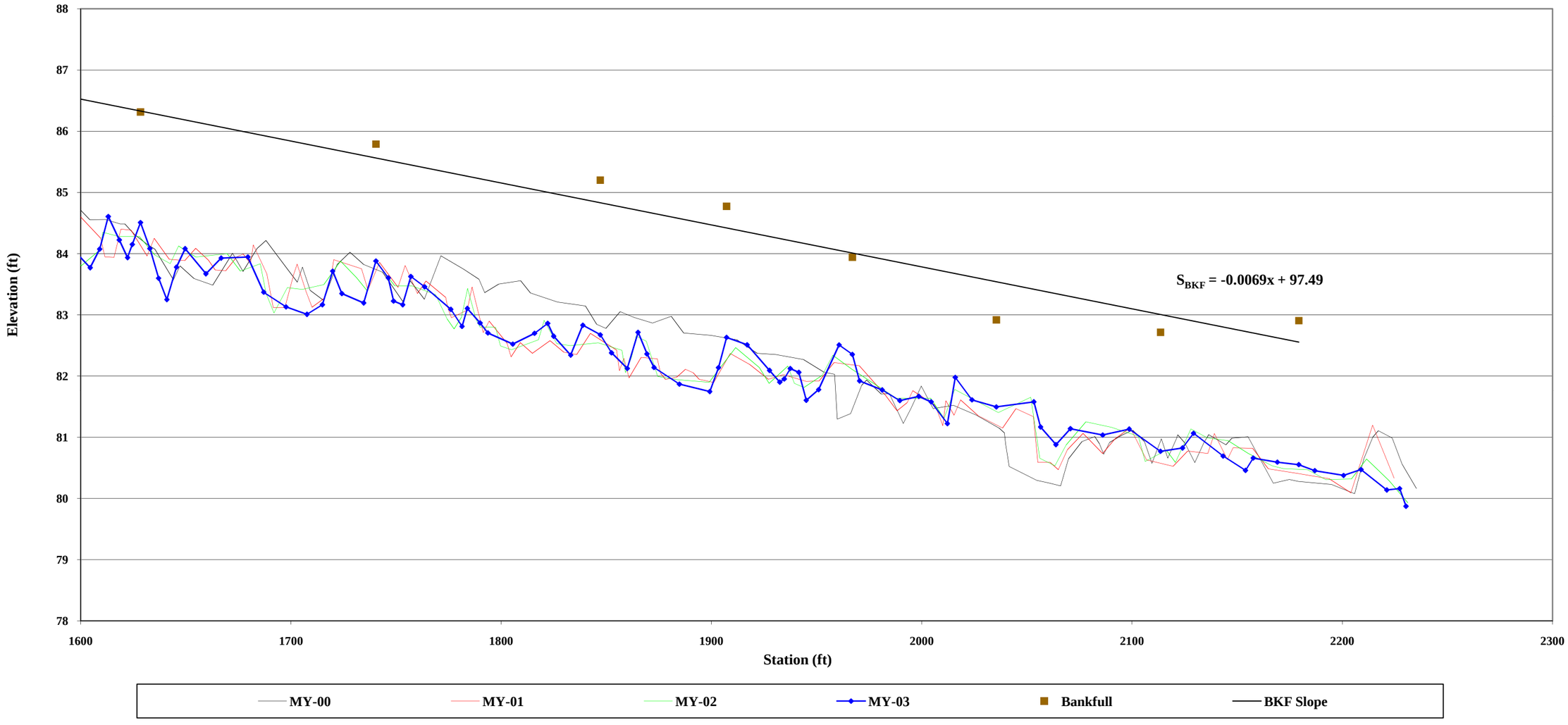
Stream Type	C5



Appendix C2 – Longitudinal Profile

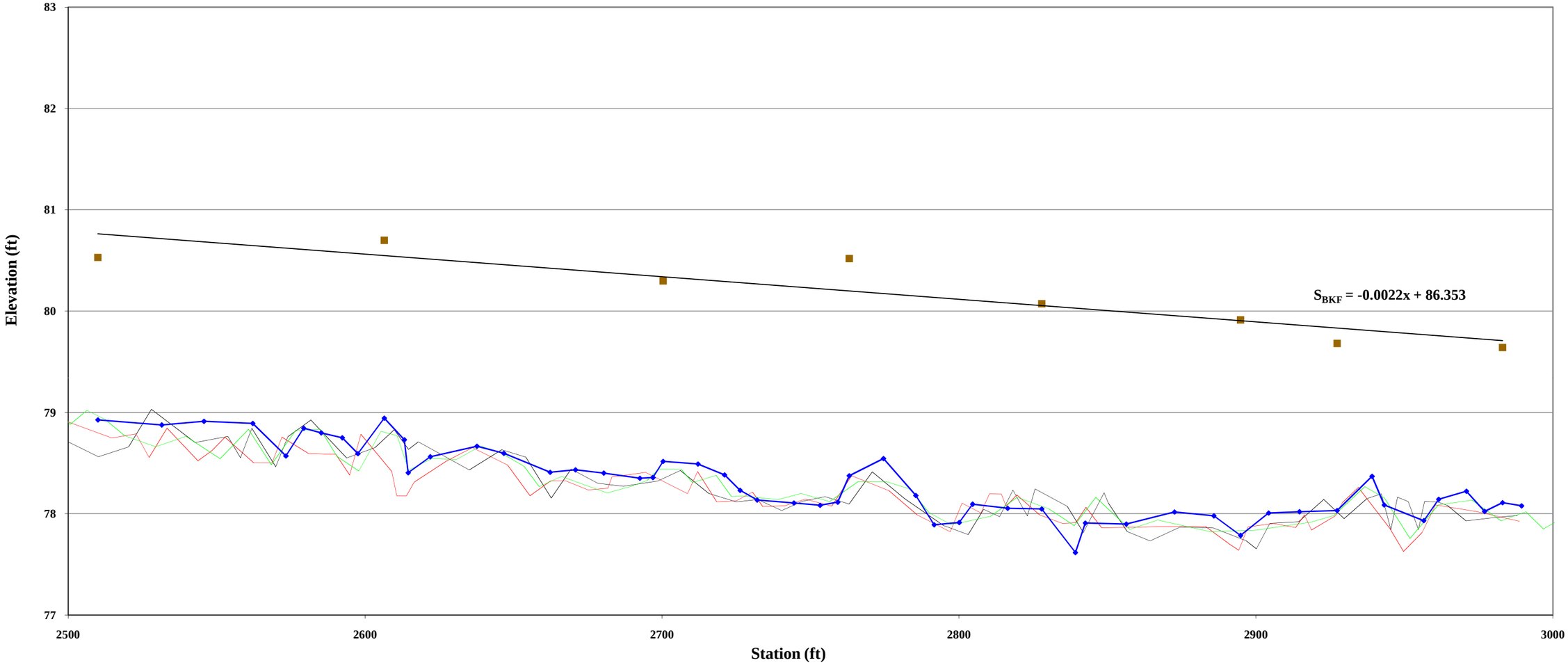
C2 - Stream Longitudinal Profiles

Longitudinal Profile
Harrell Stream Restoration MY-03
Reach 1 - Station 16+00 - 22+35



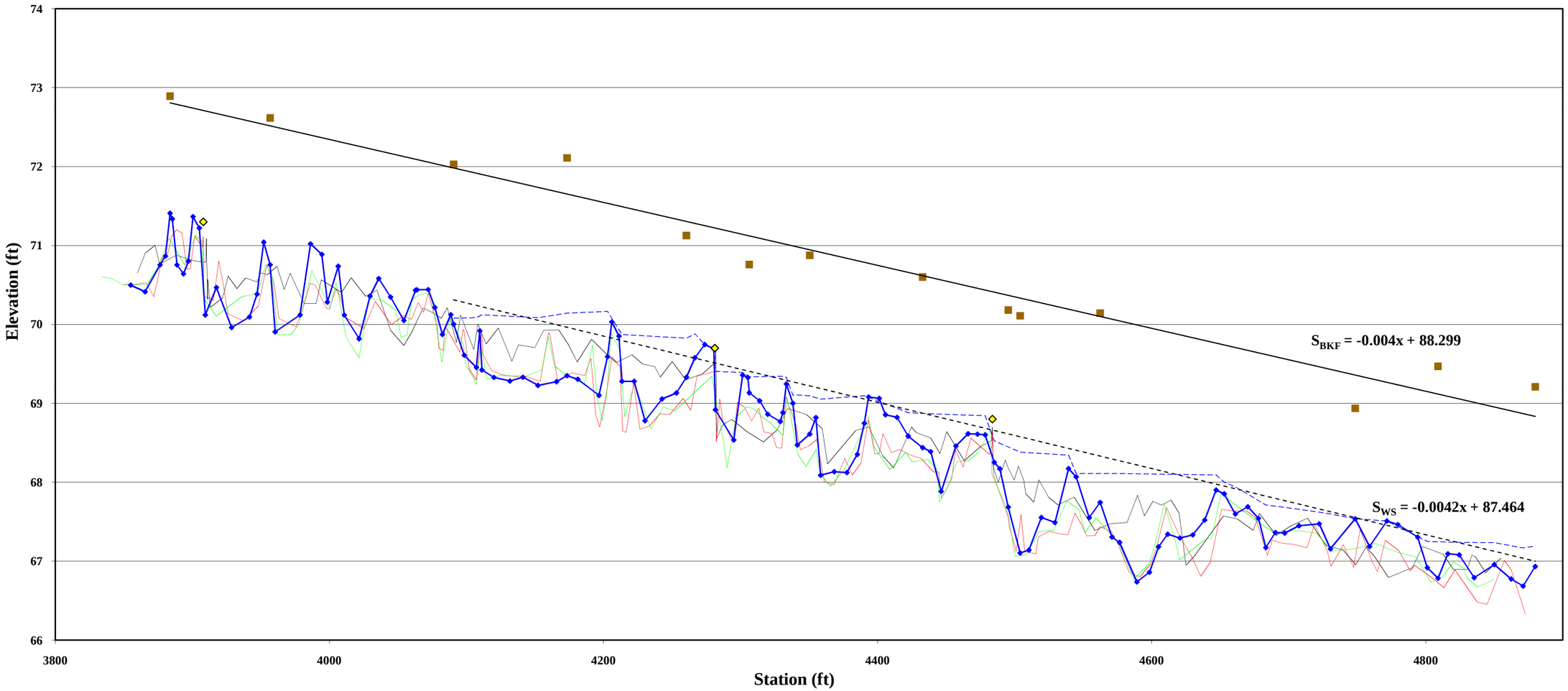
*Due to no flowing water in the channel, water surface and water surface slope were not recorded.

Longitudinal Profile
Harrell Stream Restoration MY-03
Reach 2 - Station 25+00 - 29+90

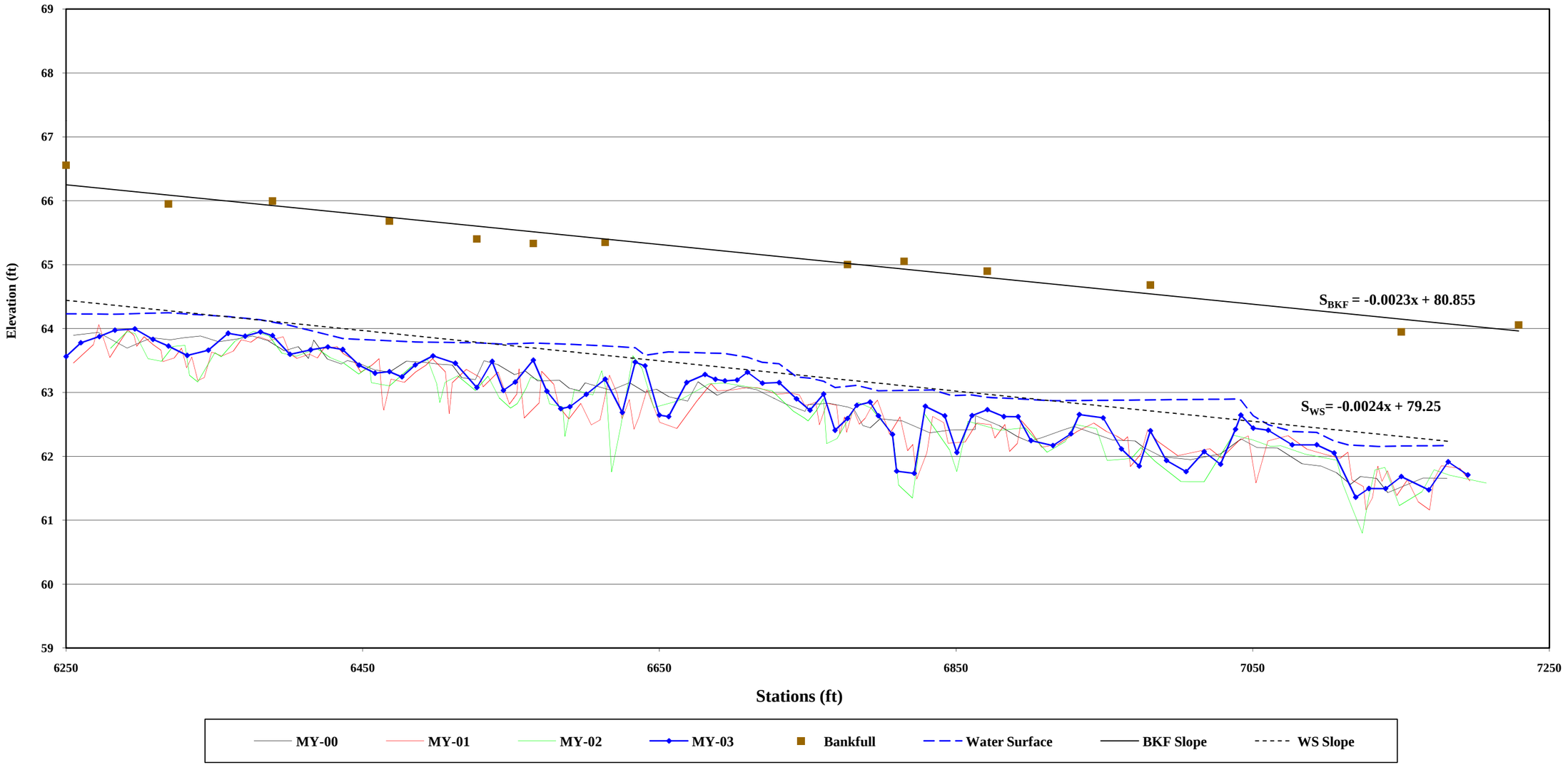


*Due to no flowing water in the channel, water surface and water surface slope were not recorded.

Longitudinal Profile
Harrell Stream Restoration MY-03
Reach 3 - Station 38+60 - 48+50



Longitudinal Profile
Harrell Stream Restoration MY-03
Reach 4 - Station 62+50 - 71+80

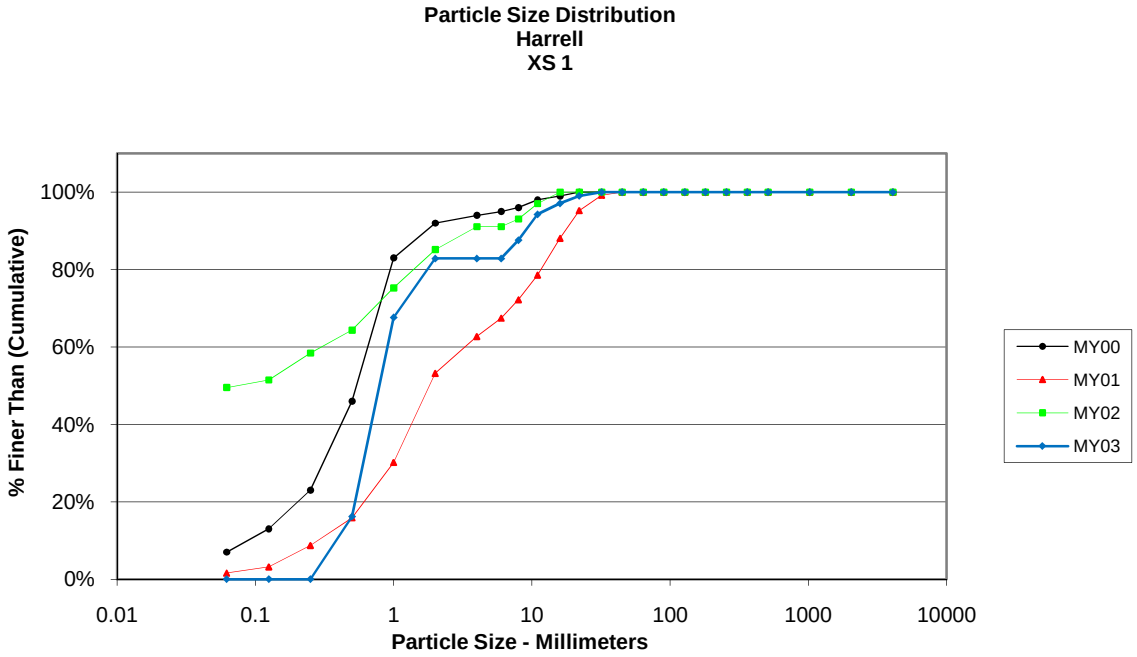


Appendix C3 – Pebble Count Data

C3 - Stream Pebble Counts

Cross-Section 1 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	17
Coarse	.50 - 1	D	54
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	105

Note:



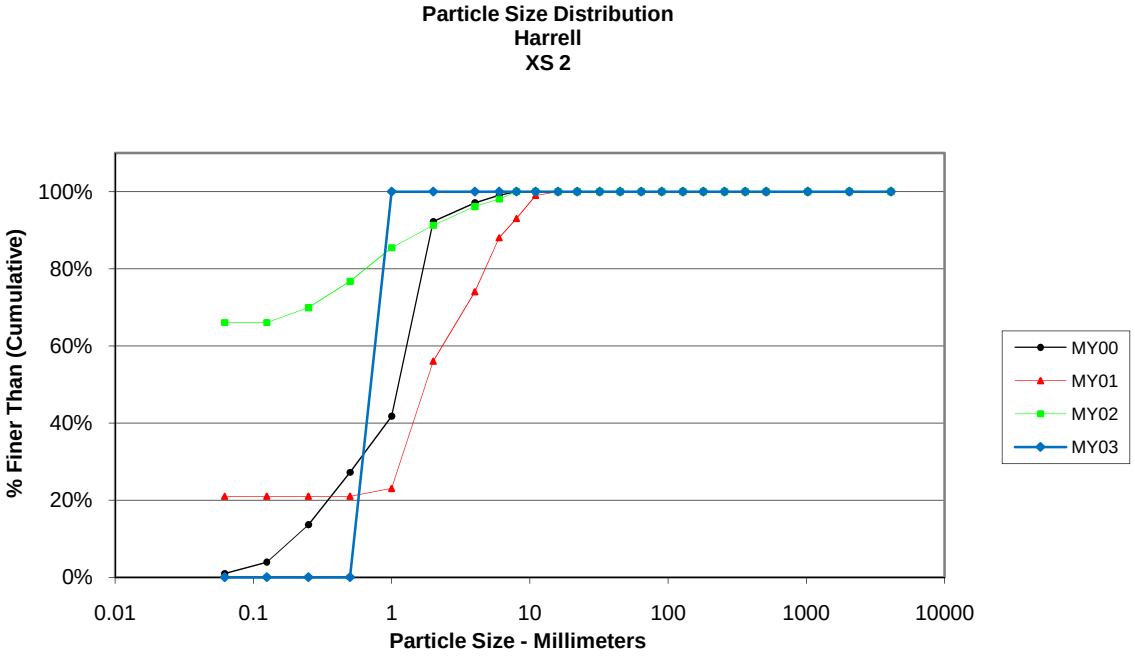
Size (mm)	
D16	0.05
D35	0.64
D50	0.79
D65	0.97
D84	6.4
D95	12

Size Distribution	
mean	1.8
dispersion	4.8
skewness	0.34

Type	
silt/clay	0%
sand	83%
gravel	17%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 2 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	100
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



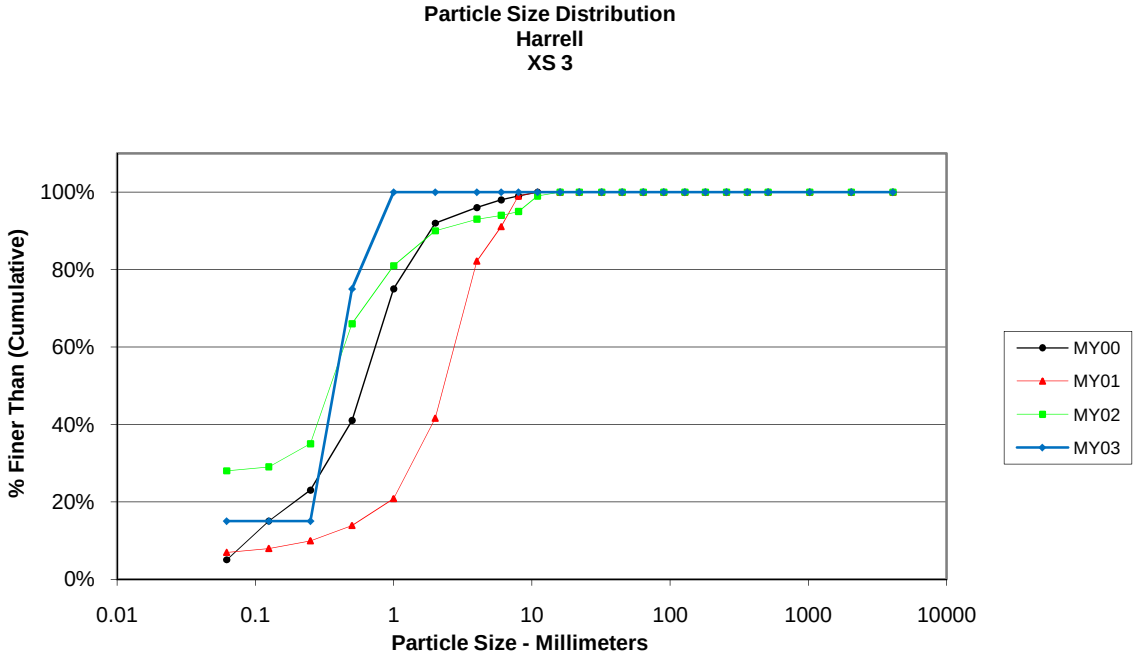
Size (mm)	
D16	1.1
D35	1.3
D50	1.4
D65	1.6
D84	1.8
D95	1.9

Size Distribution	
mean	1.4
dispersion	1.3
skewness	0.00

Type	
silt/clay	0%
sand	100%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 3 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	15
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	60
Very Coarse	1 - 2	S	25
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



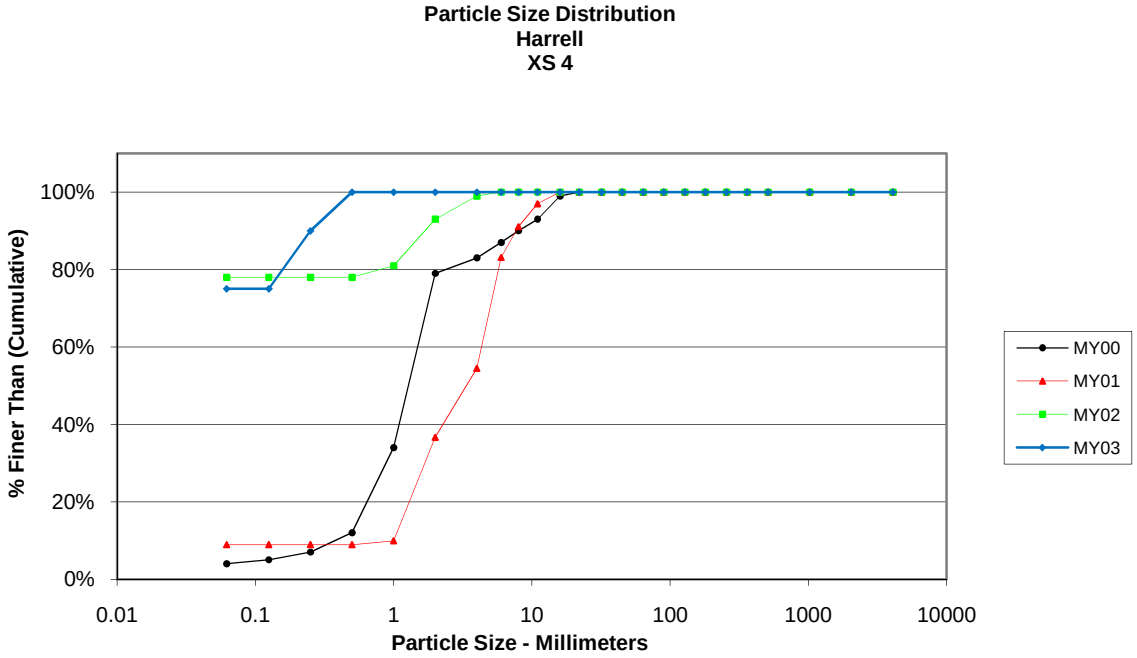
Size (mm)	
D16	0.51
D35	0.63
D50	0.75
D65	0.9
D84	1.3
D95	1.7

Size Distribution	
mean	0.8
dispersion	1.6
skewness	0.06

Type	
silt/clay	15%
sand	85%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	75
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	15
Coarse	.50 - 1	D	10
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



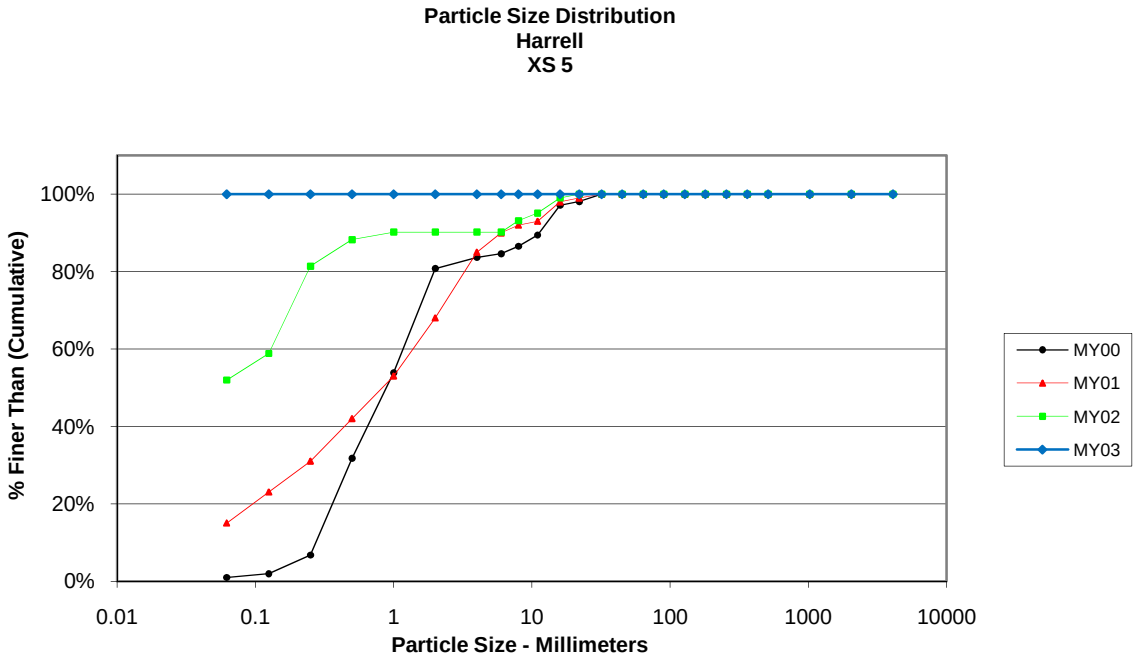
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.19
D95	0.35

Size Distribution	
mean	0.1
dispersion	2.0
skewness	0.35

Type	
silt/clay	75%
sand	25%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



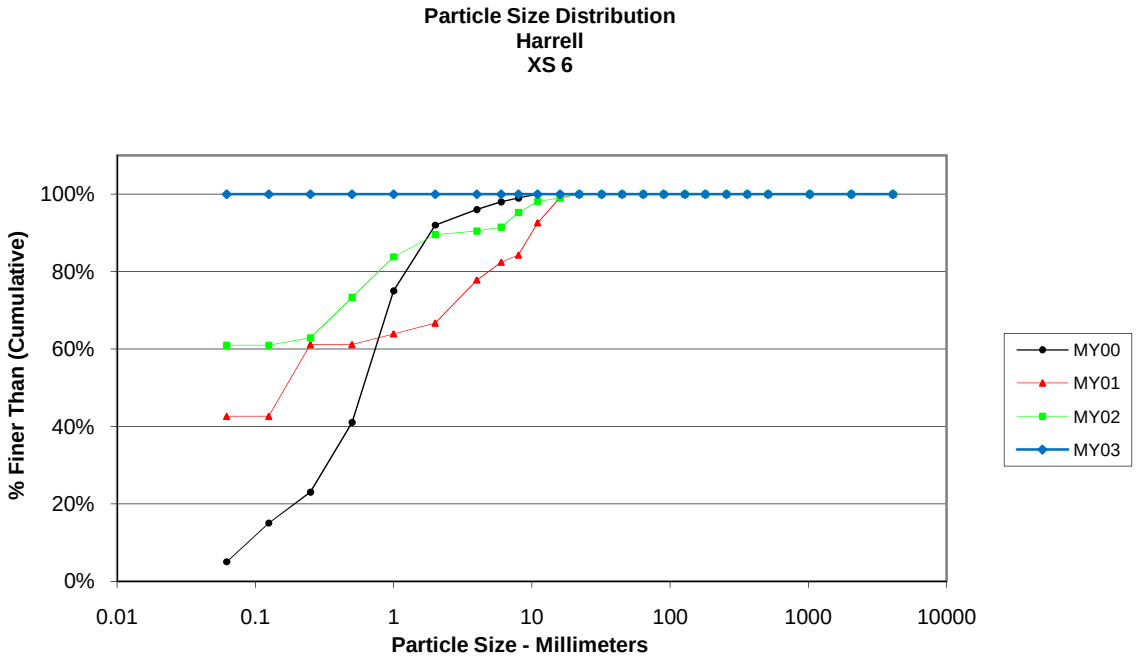
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



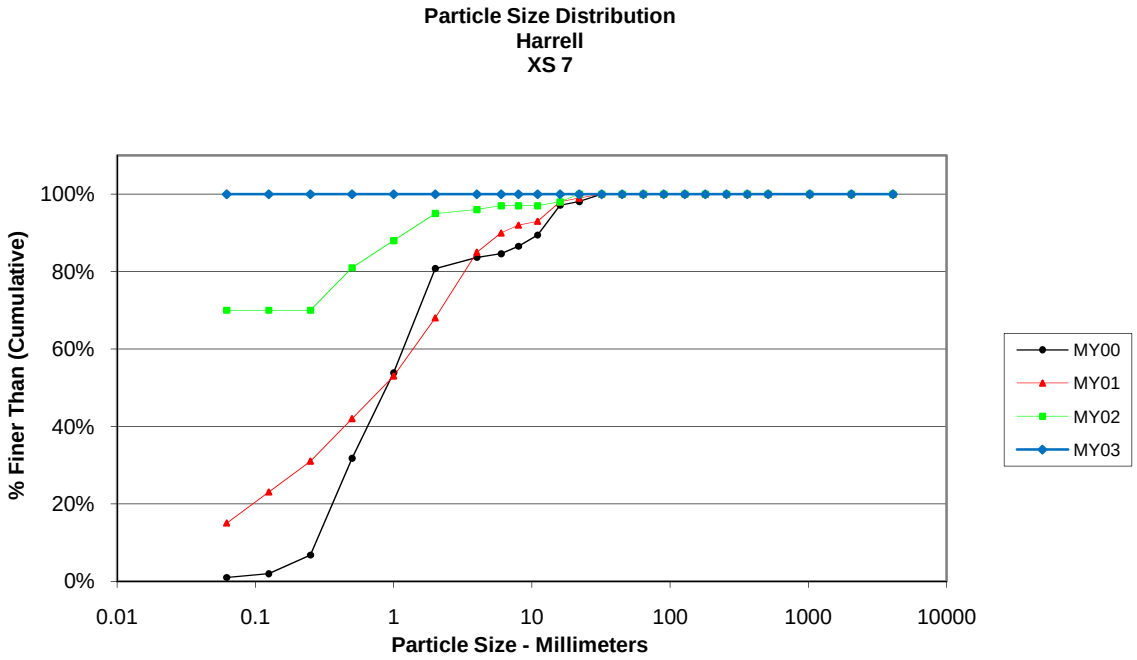
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



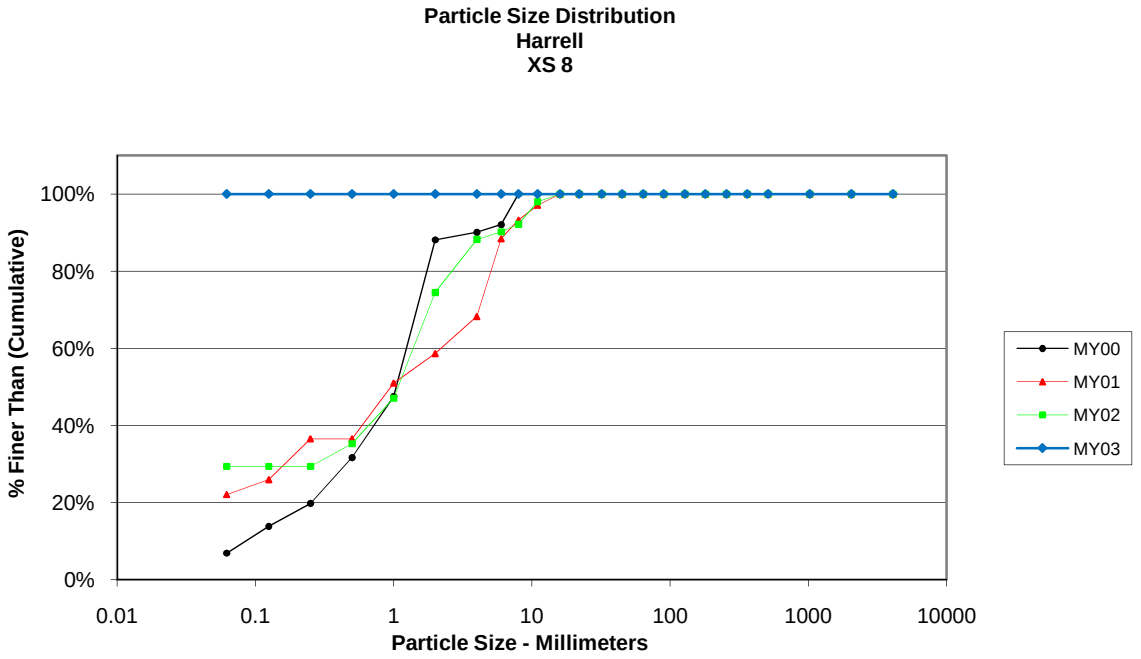
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



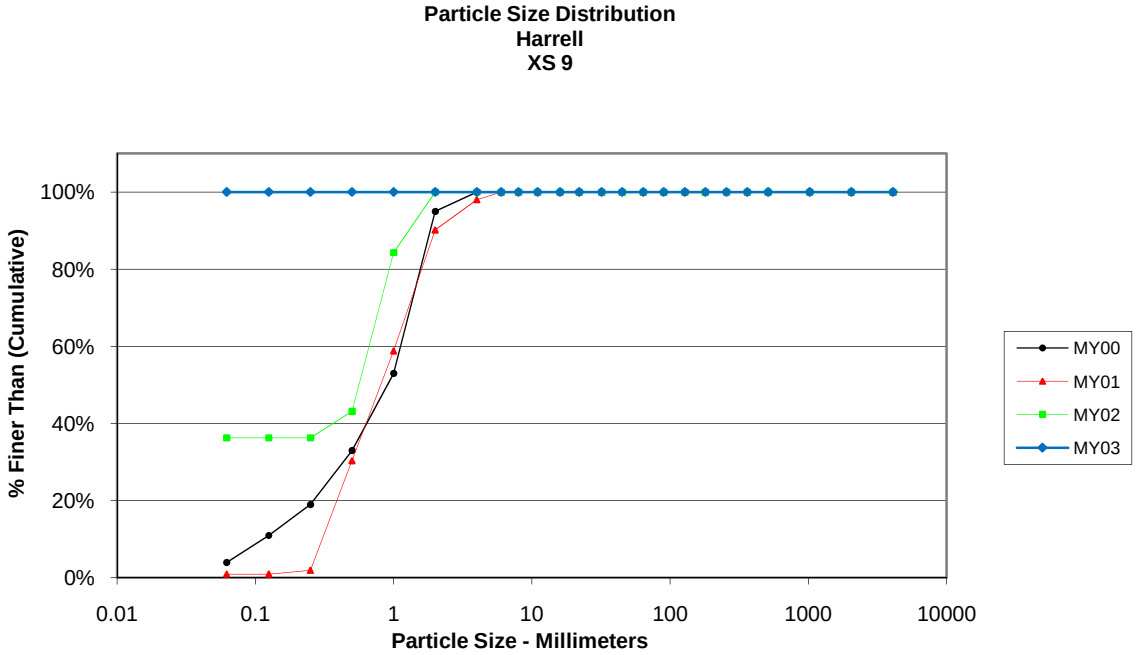
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



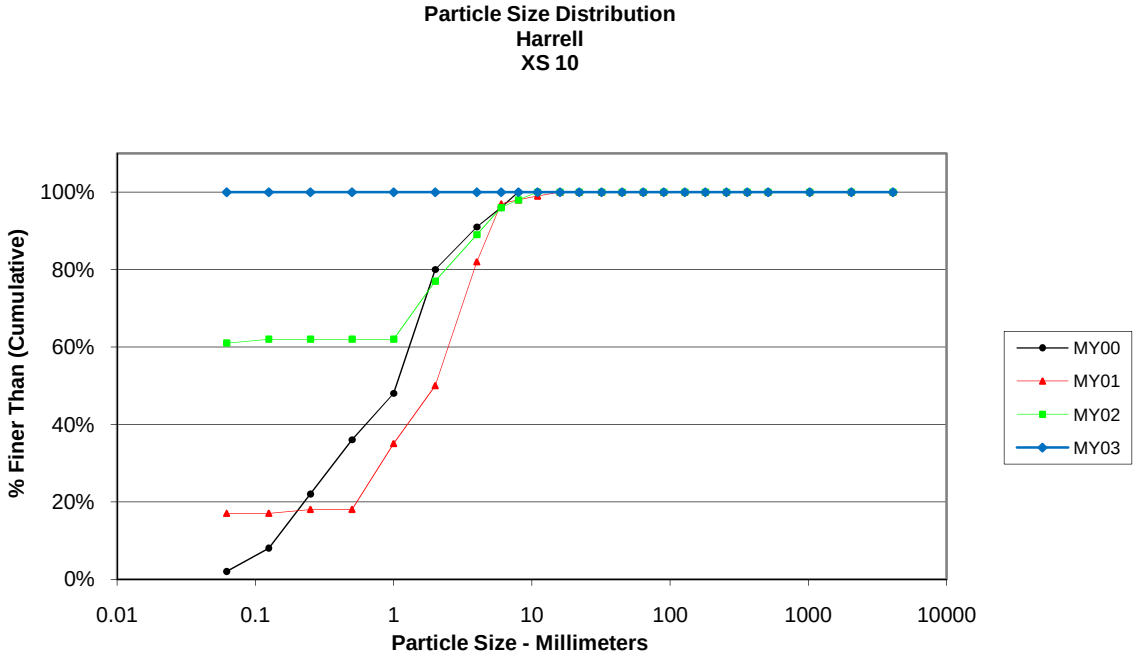
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



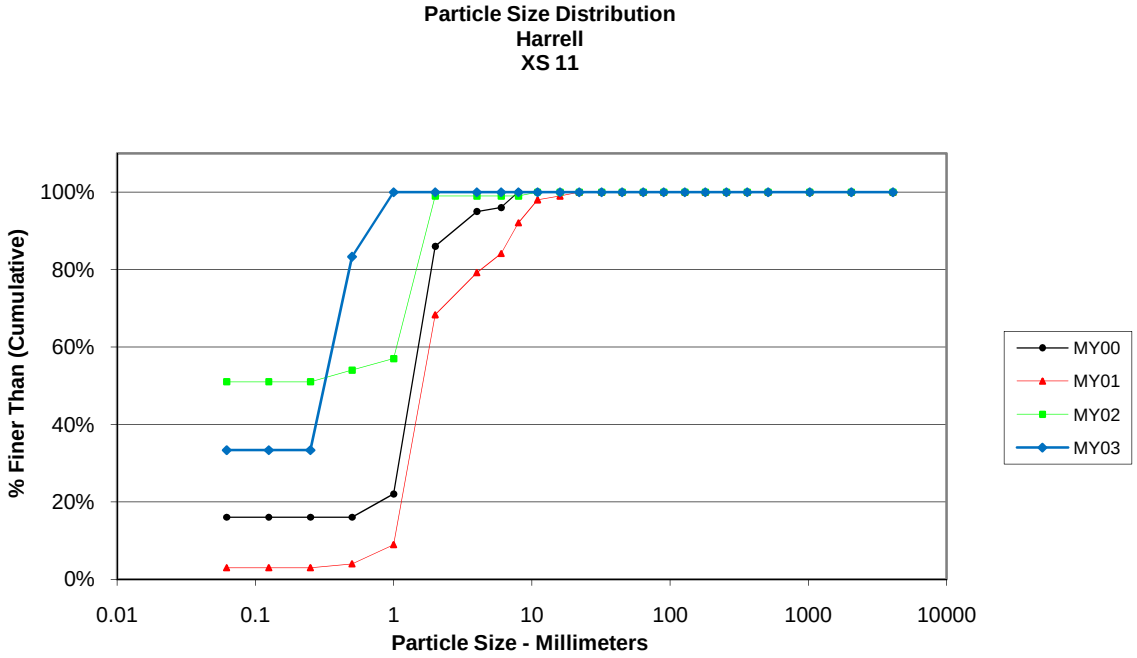
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 11 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	30
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	45
Coarse	.50 - 1	D	25
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



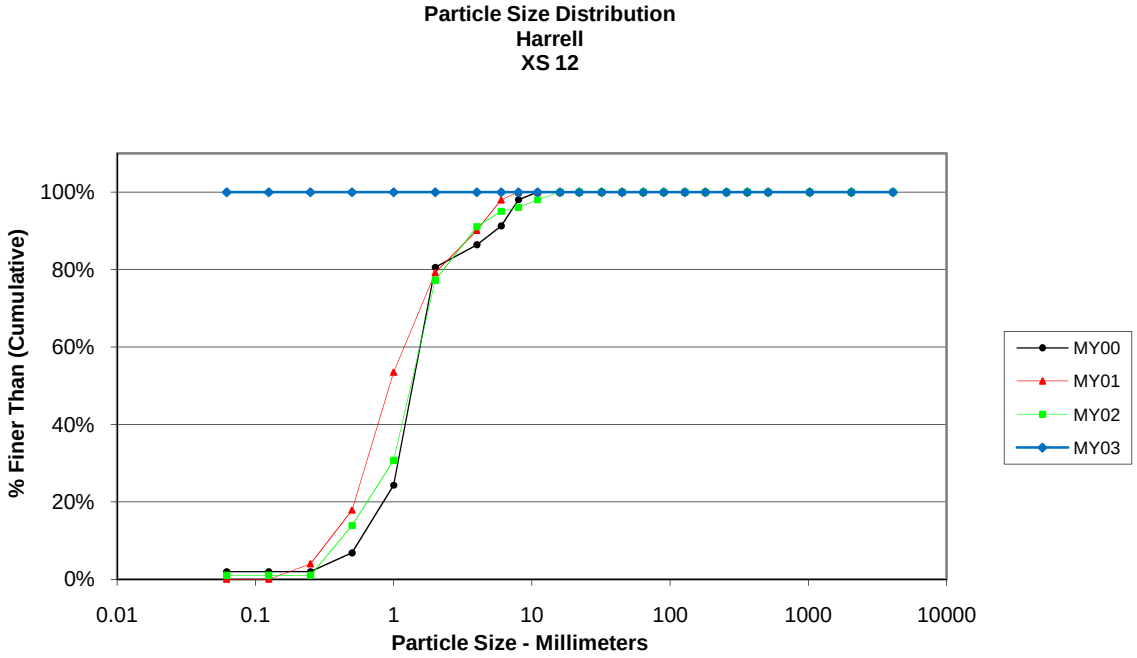
Size (mm)	
D16	0.062
D35	0.27
D50	0.34
D65	0.43
D84	0.64
D95	0.87

Size Distribution	
mean	0.2
dispersion	3.7
skewness	-0.23

Type	
silt/clay	30%
sand	70%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



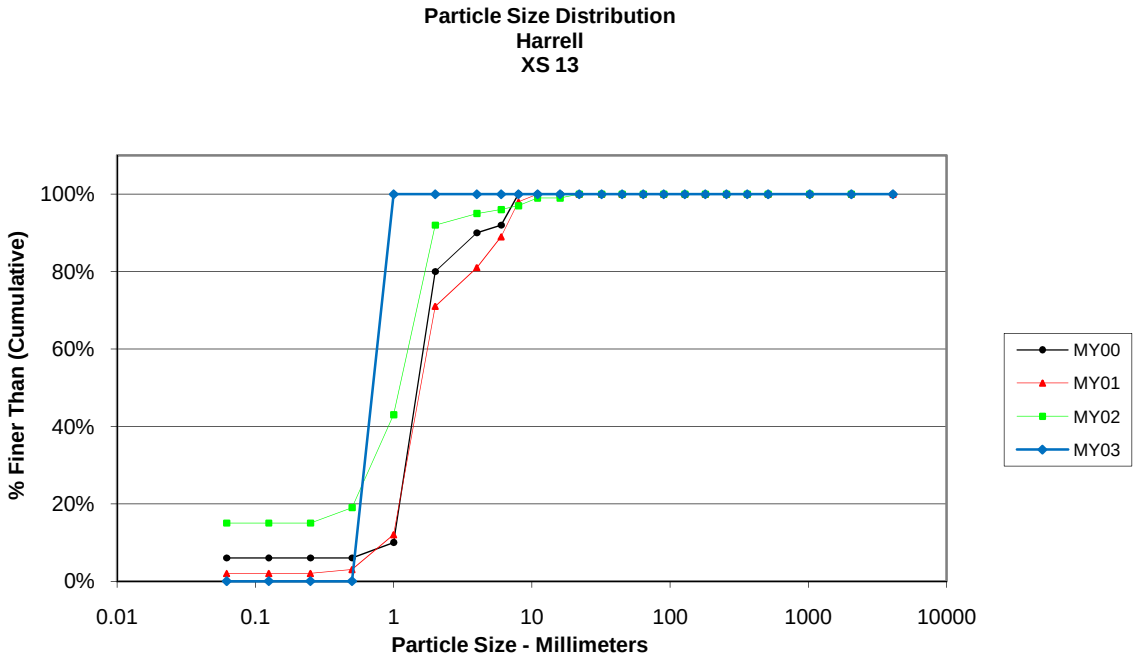
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	-

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	100
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



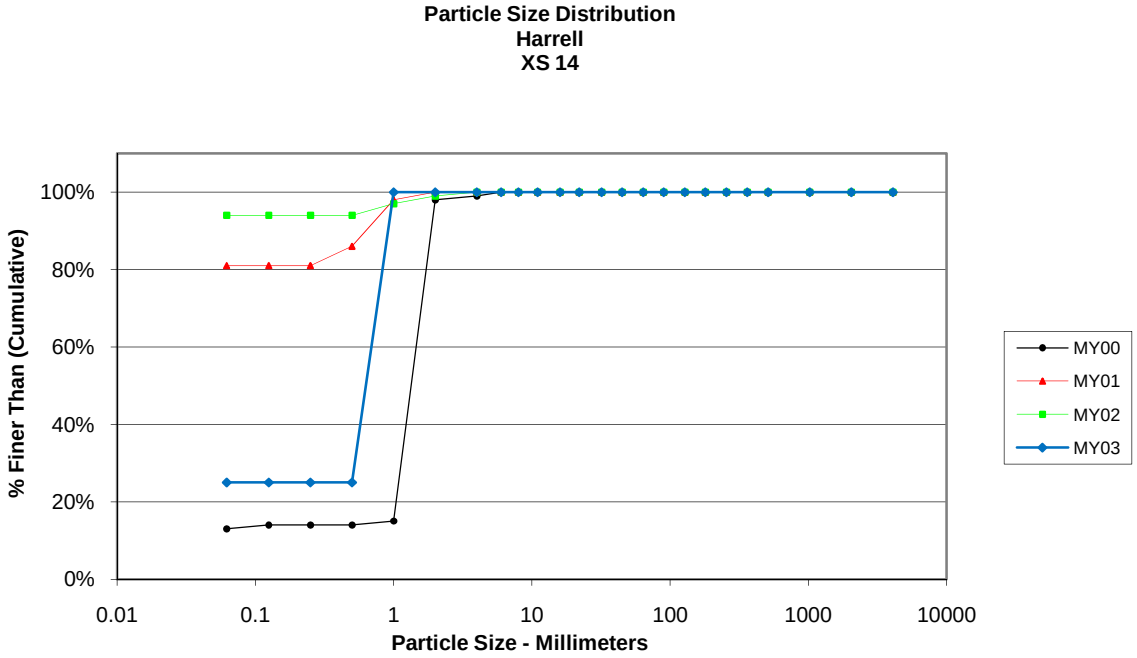
Size (mm)	
D16	0.560
D35	0.64
D50	0.71
D65	0.78
D84	0.9
D95	0.97

Size Distribution	
mean	0.7
dispersion	1.3
skewness	0.00

Type	
silt/clay	0%
sand	100%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	25
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	75
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



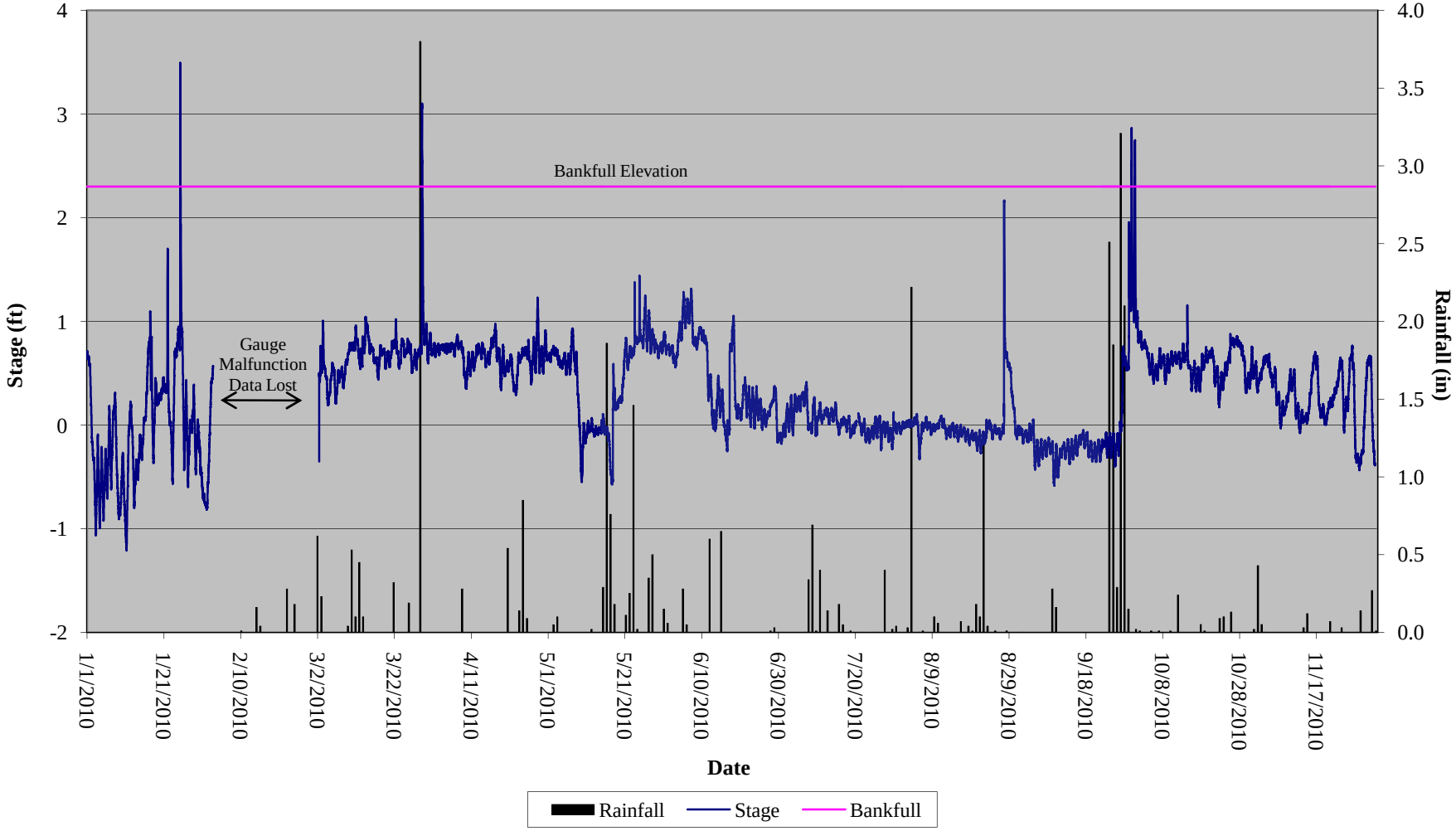
Size (mm)	
D16	0.062
D35	0.55
D50	0.63
D65	0.72
D84	0.86
D95	0.95

Size Distribution	
mean	0.2
dispersion	5.8
skewness	-0.41

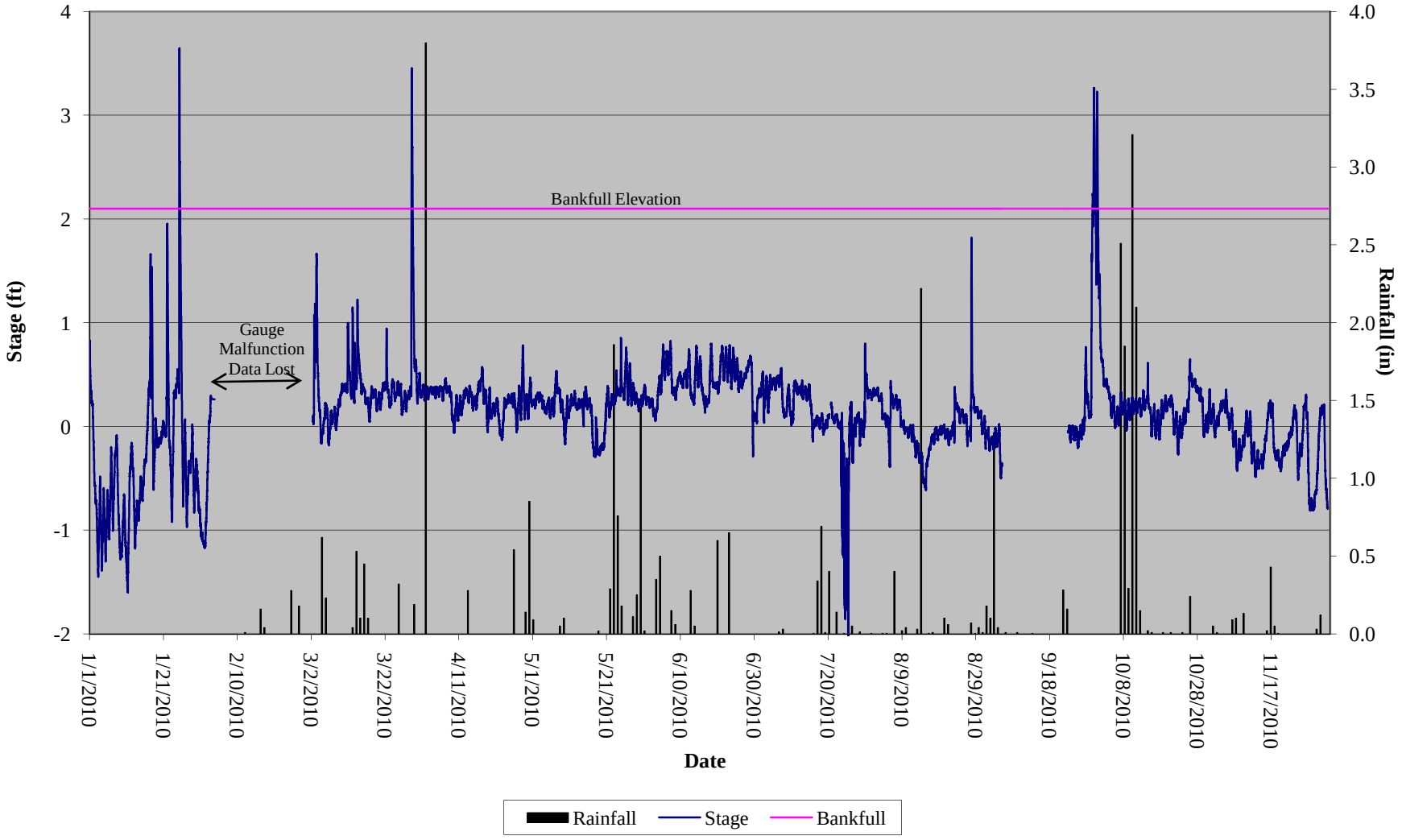
Type	
silt/clay	25%
sand	75%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Appendix C4 – Stream and Wetland Hydrographs

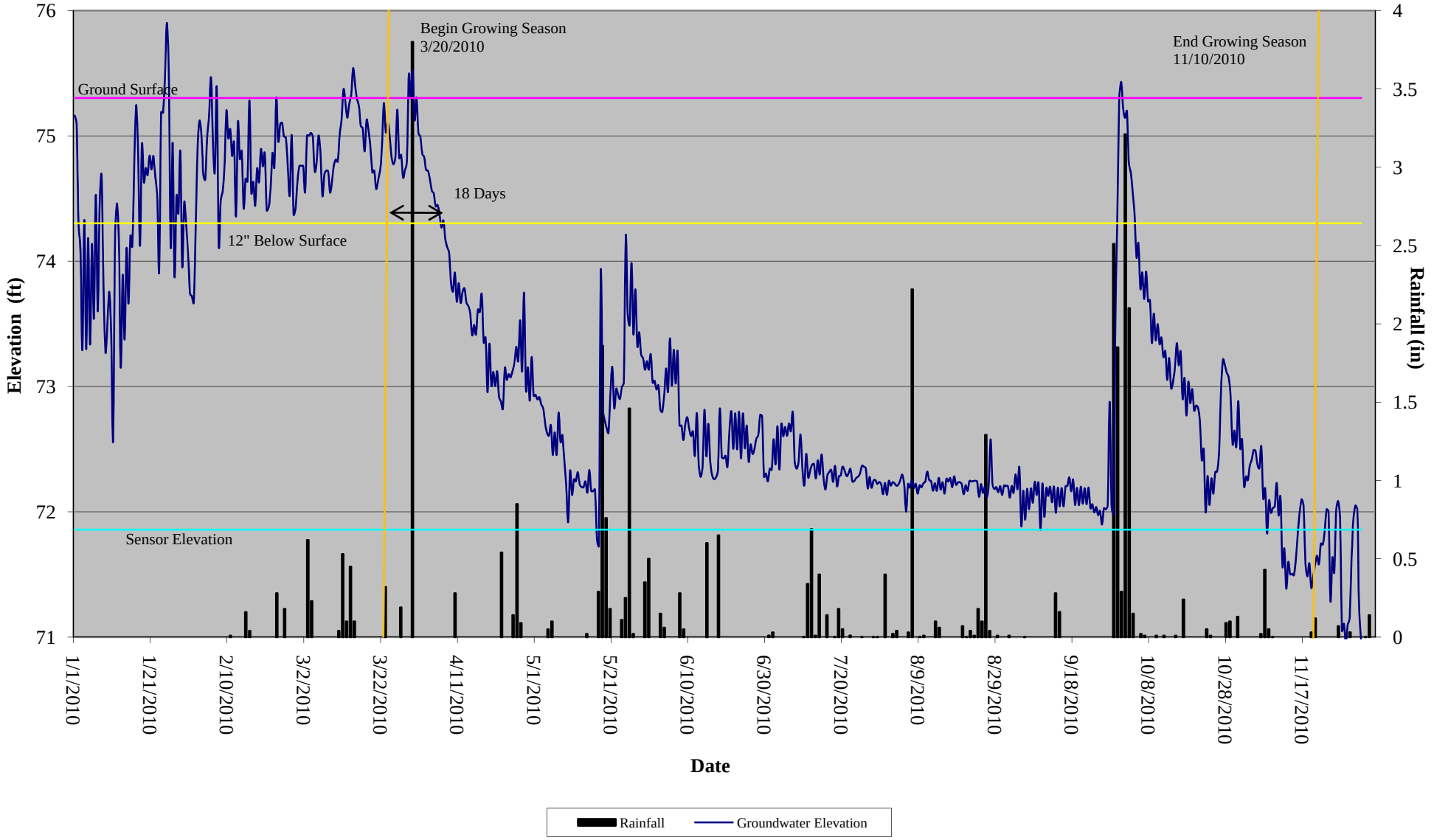
Harrell Stream and Wetland Restoration
Stream Gauge 1 Hydrograph
1/1/10 to 11/29/10



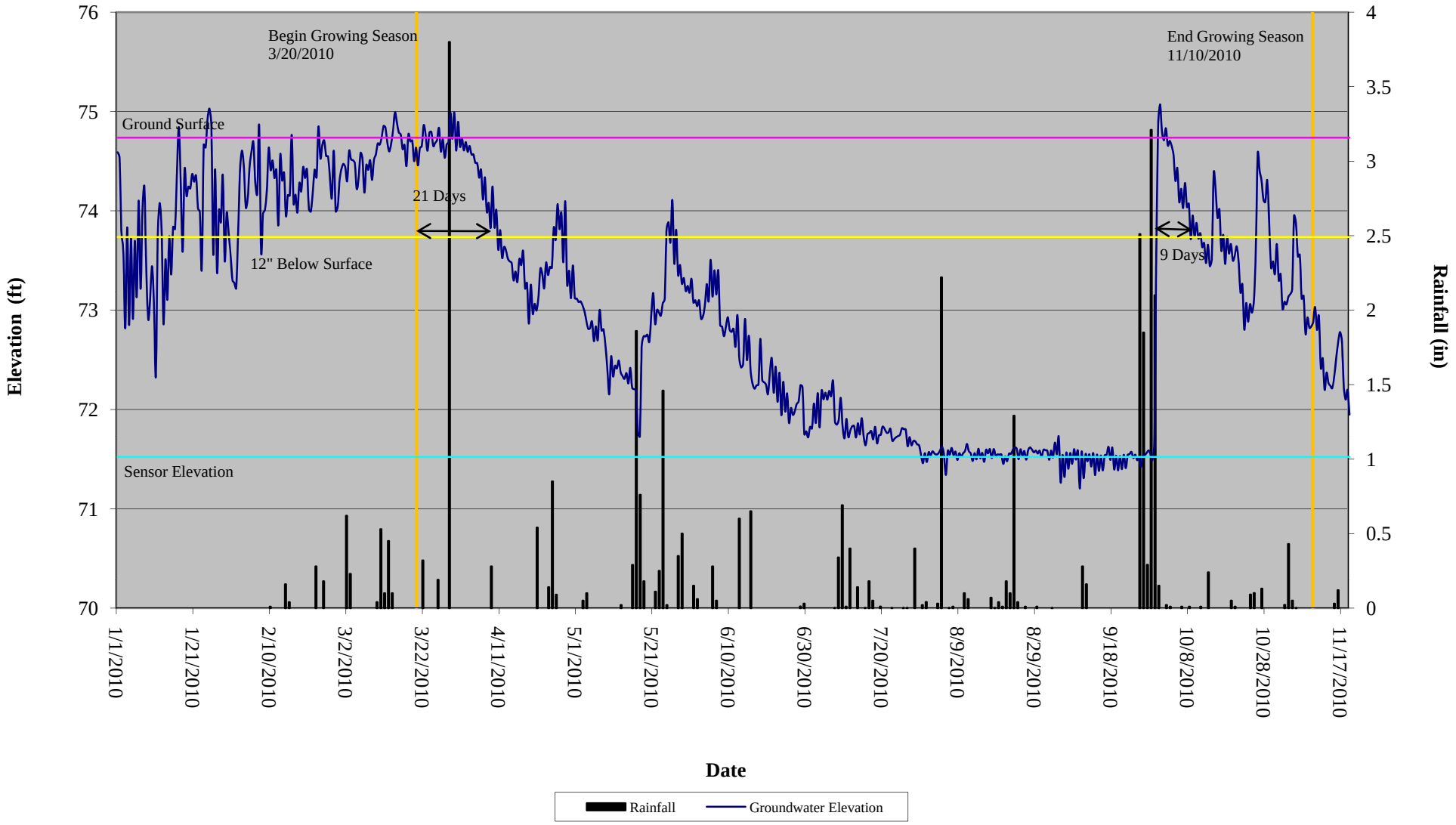
Harrell Stream and Wetland Restoration
Stream Gauge 2 Hydrograph
1/1/10 to 11/29/10



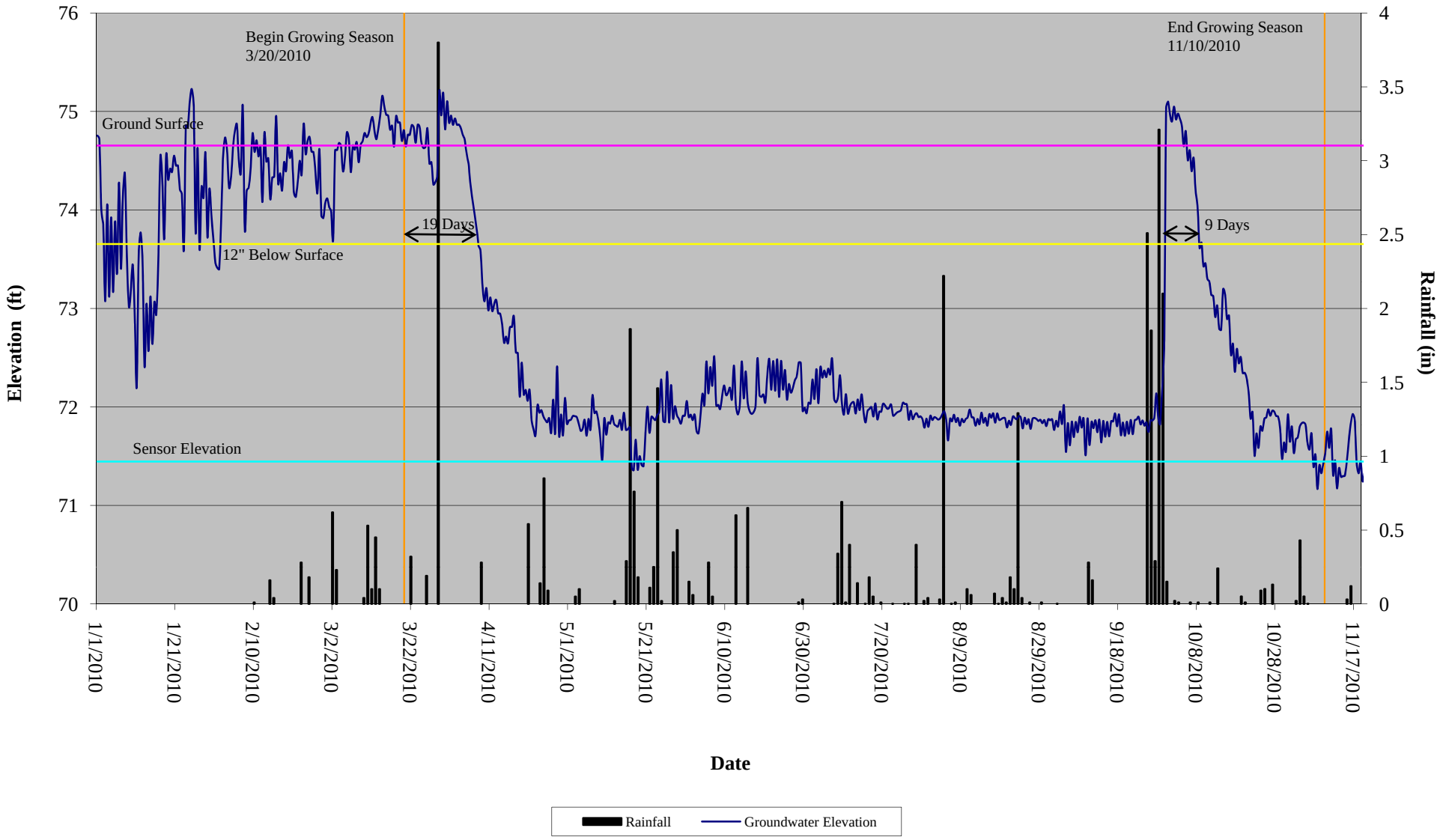
Harrell Farm Gauge 1 Wetland Hydrograph
1/1/10 to 11/17/10



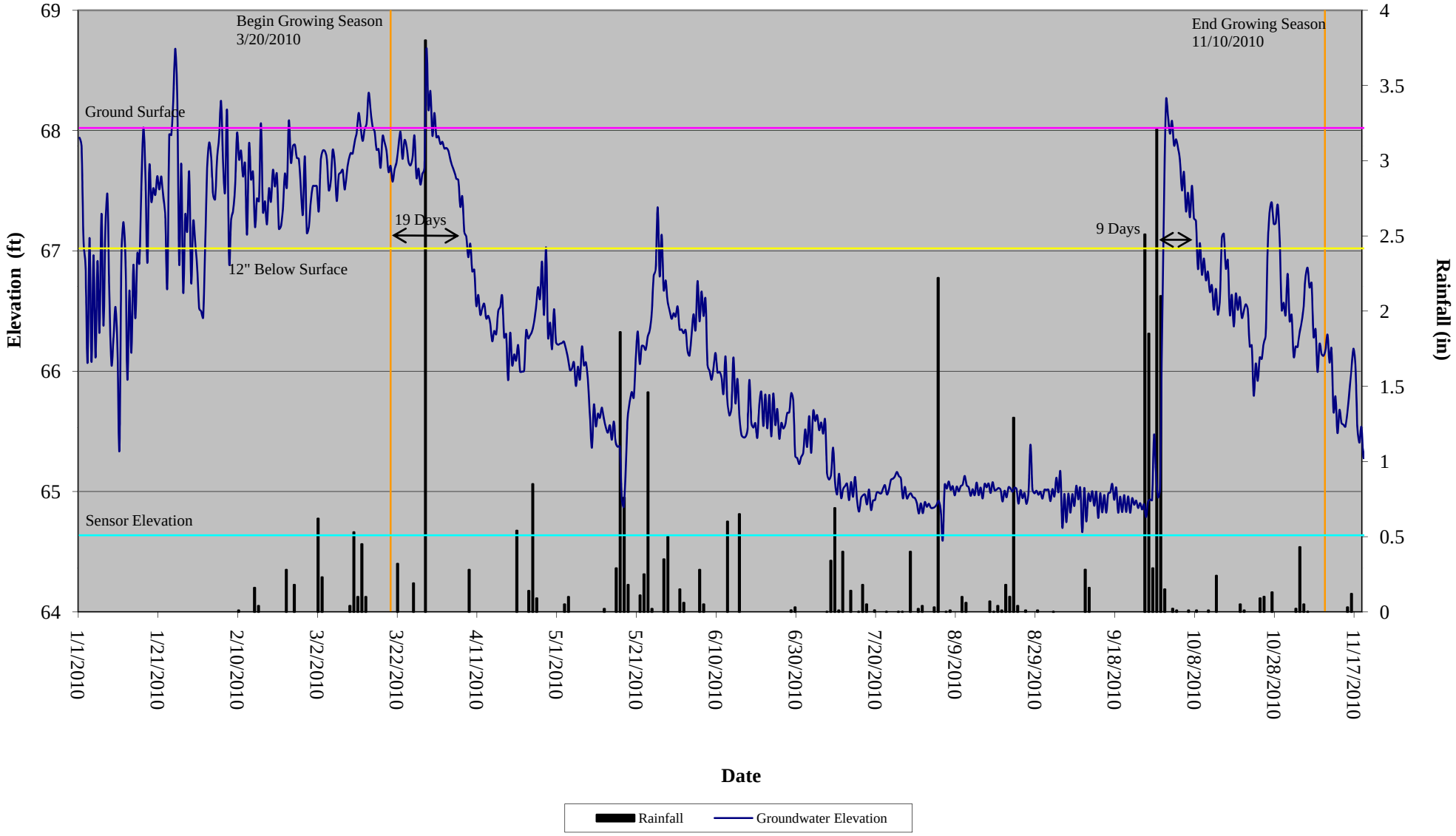
Harrell Farm Gauge 2 Wetland Hydrograph
1/1/10 to 11/17/10



Harrell Farm Gauge 3 Wetland Hydrograph
1/1/10to 11/17/10



Harrell Farm Gauge 4 Wetland Hydrograph
1/1/10 to 11/17/10



Appendix C5 – Precipitation 30-70 Percentile Graph

Harrell 30-70 Percentile Graph 2009-2010
Rocky Mount, NC Monthly Rainfall